Institute of Automation and information technologies
Department of Software Engineering

EDUCATIONAL PROGRAM
6B06102 «Computer Science»

Code and classification of the field of education: **6B06 «Information and communication technologies»**
Code and classification of training directions: **6B061 «Information and communication technologies»**
Group of educational programs: **B057 «Information technologies»**
Level based on NQF: **6**
Level based on IQF: **6**
Study period: **4 years**
Amount of credits: **240**

Almaty 2025

NON-PROFIT JOINT STOCK COMPANY
«KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATBAYEV»

Educational program 6B06102 «Computer Science» was approved at the meeting of K.I.Satbayev KazNRTU Academic Council.
Minutes No. 10 dated March 6, 2025.

Was reviewed and recommended for approval at the meeting of K.I.Satbayev KazNRTU Educational and Methodological Council.
Minutes No. 3 dated December 20, 2024.

Educational program 6B06102 «Computer Science» was developed by Academic committee based on direction 6B061 «Information and communication technologies».

№	Full name	Academic degree/ academic title	Position	Workplace	Signature
Field of Study: **6B061, 7M061, 8D061 – Information and Communication Technologies**					
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F KazNRTU 703-05 Educational program

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

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* The composition of the Academic Committees for the 2025–2026 academic year was approved by Order No. 228-П/Ө dated April 28, 2025.

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F KazNRTU 703-05 Educational program

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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
IT – information Technology

1. Description of educational program

The educational program 6B06102 «Computer Science» is aimed at teaching student's general education, basic and specialized disciplines with the achievement of relevant competencies:

- to provide practice-oriented training of graduates in the field of software development, information systems and specialists in the field of data analysis. Training of graduates who are able to apply various technologies, knowledge and skills of software development, definition and management of information systems, data analysis to perform operational and project activities;

- to prepare graduates for production and technological activities related to the process of developing and modifying software products aimed at meeting the expectations and requirements of users, for organizational and managerial activities related to the maintenance of software products of various classes and categories, information systems management, data analysis;

- create conditions for continuous professional self-improvement, development of social and personal competencies of graduates (broad cultural outlook, active citizenship, commitment, organization, diligence, sociability, ability to argue and make organizational and managerial decisions, knowledge of modern information technologies, fluency in several languages, striving for self-development and commitment to ethical values and a healthy lifestyle life, the ability to work in a team, responsibility for the final result of their professional activities, civic responsibility, tolerance), social mobility and competitiveness in the labor market.

The EP is based on the state educational standard for higher professional education; on the professional standard; Atlas of New Professions.

The content of the disciplines of the educational program has been developed considering the relevant educational programs of the world's leading universities, the international classifier of professional activity in the field of information and communication technologies.

Graduates of the educational program 6B06102 «Computer Science» are focused on the organization, design and development of software for applied purposes for all sectors of the economy, government organizations and other fields of activity.

The educational program ensures the application of an individual approach to students, the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Student–centered learning is provided - the principle of education, which assumes a shift of emphasis in the educational process from teaching (as the main role of the teaching staff in the "translation" of knowledge) to teaching (as an active educational activity of the student).

The educational program provides training of specialists in the field of information security in 2 directions:

- Software engineering. Software developers of a wide range. The educational program provides knowledge of various programming paradigms and operating

systems, obtaining skills in designing and developing software products for any platform.

- Artificial intelligence. Data analysis specialists. The educational program provides knowledge of various models and methods of data analysis, including modern tools for extracting and processing large amounts of data, the use of artificial neural network models for classification and regression problems, methods and algorithms related to the field of artificial intelligence.

The educational program was developed based on the analysis of the labor functions of software development engineers, artificial intelligence and data science specialists.

Representatives of Kazakhstani companies and associations, specialists of departmental structures in the field of software development, artificial intelligence and data science participated in the development of the educational program.

In case of successful completion of the full bachelor's degree course, the graduate is awarded a bachelor's degree in information and communication technologies under the EP 6B06102 «Computer Science».

2. Purpose and objectives of educational program

Purpose of EP: Comprehensive training of IT specialists in the field of computer science for work in industry, business, and government institutions, combined with a solid foundation in machine learning, data science, software development, and the principles of sustainable development in a digital environment.

Tasks of EP:

- socio-humanitarian and professional training of bachelors in the field of computer science in accordance with the development of science and production, as well as with the needs of the ICT clusters of Kazakhstan, the IT industry of the Republic of Kazakhstan, national research centers, master's and doctoral studies of higher educational institutions;
- integration of educational and scientific activities;
- establishing partnerships with leading universities of the near and far abroad in order to improve the quality of education;
- Developing students' understanding of ESG principles and inclusive culture in the context of digital transformation and IT project management.

The curriculum of the educational program 6B06102 "Computer Science" is implemented in accordance with the credit-based learning system and is delivered in Kazakh, Russian, and English.

The educational program will make it possible to implement the principles of the Bologna process. Based on the choice and independent planning by students of the sequence of studying disciplines, they independently form an individual study plan (IUP) for each semester according to the Working Curriculum and the Catalog of elective disciplines. The volume of mathematical, natural science, basic and language disciplines has been increased in the educational program.

The following basic disciplines are studied: «Algorithmization and programming basics», «Algortihms and Data Structures», «Object oriented programming», «Application design patterns», « Computer architecture and consistency of operations», «Operating systems», «Computer Networks», «Databases», «Web Application Development», «Artificial Intelligence», «Fundamentals of sustainable development and ESG projects in Kazakhstan», «ESG principles in inclusive culture», «Mathematical Optimization Methods», «Numerical methods and programming».

Students have internships in banking structures, government and departmental structures, in companies such as JSC «Institute of Digital Technology and Engineering», JSC «Kaspi Bank», JSC «Halyk Bank», LLP «Suretter Software», JSC «CenterCredit Bank», JSC «Otbasy Bank», etc.

According to the academic mobility program, the best students can study at leading foreign universities according to the corresponding EP.

3. Requirements for evaluating the educational program learning outcomes

The educational program was developed in accordance with the State mandatory Standards of higher and Postgraduate Education, approved by the 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 Regulatory Legal Acts under No. 28916) and reflects the learning outcomes on the basis of which curricula are developed (working curricula, individual curricula of students) and working curricula in disciplines (syllabuses). Mastering disciplines of at least 10% of the total volume of credits of the educational program using MOOC on the official platform https://polytechonline.kz/cabinet/login/index.php/, as well as through the study of disciplines through the international educational platform Coursera https://www.coursera.org/.

Evaluation of learning outcomes is carried out according to the developed tasks within the educational program in accordance with the requirements of the state mandatory standard of higher and postgraduate education.

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

When conducting an interim certification in an online form, 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	6B06 «Information and communication technologies»
2	Code and classification of training directions	6B061 «Information and communication technologies»
3	Educational program group	B057 «Information technologies»
4	Educational program name	6B06102 «Computer Science»
5	Short description of educational program	To provide practice-oriented training of graduates in the field of software development, information systems and specialists in the field of data analysis. Training of graduates who are able to apply various technologies, knowledge and skills of software development, identification and management of information systems, data analysis to perform operational and project activities.
6	Purpose of EP	The goal of the educational program is to comprehensively prepare IT professionals in the field of computer science for work in industry, business and government, combined with a solid foundation in machine learning, data science and software development.
7	Type of EP	New
8	The level based on NQF	6
9	The level based on IQF	6
10	Distinctive features of EP	No
11	List of competencies of educational program	Basic competencies: To program in modern algorithmic languages, to understand the fundamental principles of software construction; to master various approaches in programming methodology, to know the paradigms of modular and object-oriented programming. Organize, manage and ensure the processes of the full life cycle of testing; develop regulations, test schedules; Simulate test processes, test data, function responses to test impacts; analyze the compliance of software characteristics in technical and project documentation; generate testing documentation. Professional competencies: Be able to create and configure scalable applications using the object-oriented programming paradigm. Use design patterns. Plan and carry out work on the organization of data collection, analysis and interpretation processes.
12	Learning outcomes of educational program	**ON1:** Analyzes and evaluates corruption studies using the theory and methods of the sociological study of corruption. **ON2:** Demonstrate the ability to configure and maintain information systems, including determining the topology of network interaction of computing resources. **ON3:** Demonstrate an understanding of the basics of information security and ways to prevent various attacks

		on information systems. **ON4:** Demonstrate an understanding of the fundamentals of programming, software development, development of algorithms and data structures, object-oriented programming. **ON5:** Collect and analyze data, materials, scientific articles, use them to solve problems related to information and communication technologies. **ON6:** Knows and understands trends in the development of computer graphics, its role and importance in IT products and objects, methods for constructing flat projection models of three-dimensional space. **ON7:** Selects standard methods and approaches for performing professional tasks and evaluates their effectiveness and quality, including aspects of sustainable development and inclusiveness in the digital environment. **ON8:** Implement machine learning and artificial intelligence algorithms. **ON9:** Knows and understands the basics of physical and mathematical, natural sciences, social, humanitarian and economic disciplines used in solving standard problems of professional activity, and influencing the formation of a harmonious personality with a broad outlook and critical thinking. **ON10:** Demonstrate basic knowledge of low-level programming, understanding of computer architecture, and software development for resource-constrained computing systems. **ON11:** Demonstrate the ability to work in a team, communicate effectively with partners, organize the process of software development. **ON12:** Design and create software, web applications, mobile applications using the UML language, modern development tools, libraries, patterns and frameworks. **ON13:** Use cloud technologies and deploy software on servers. **ON14:** Chooses methods and means of protection against dangers in everyday life and in professional activities; chooses ways to create and maintain safe living conditions. **ON15:** Compiles an infological model and a datalogical (conceptual) schema of databases, defines integrity constraints and data access rights.
13	Education form	Full-time, online
14	Period of training	4 years
15	Amount of credits	240
16	Languages of instruction	Kazakh, Russian, English
17	Academic degree awarded	Bachelor's degree in information and communication technologies
18	Developer(s) and authors	Abdoldina F.N., Gertsen Y.A., Moldagulova A.N., Mukazhanov N.K., Mukhamediev R.I.

Professional Standard for the EP

№	Name of professional standard	Date of approval of the PS
1	Development of artificial intelligence applications	05.12.2022
2	Software development	05.12.2022
3	Software maintenance support	05.12.2022
4	Computer systems infrastructure	05.12.2022
5	Testing multimedia applications (including computer games)	05.12.2022
6	Database administration	05.12.2022
7	Managing architecture of computer systems	05.12.2022
8	Software maintenance	05.12.2022
9	Development of technical documentation	05.12.2022
10	Software testing	05.12.2022
11	Graphic and multimedia design development	05.12.2022
12	Administration of graphics and operating systems	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	Generated learning outcomes (codes)														
				ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9	ON10	ON11	ON12	ON13	ON14	ON15
Cycle of general education disciplines Required component																		
1	Foreign language	English is a compulsary subject. According to the results of placement test or IELTS score, students are placed into groups and disciplines. The name of the discipline corresponds to the level of English. When passing from level to level, prerequisites and postrequisites are respected.	10									v						
2	Kazakh (russian) language	In this course author considers socio-political, socio-cultural spheres of communication and functional styles of the modern kazakh (russian) language. The course covers the specifics of the scientific style to develop and activate professional communication skills and abilities of students. Also it allows students to learn the basics of scientific style practically and develop the ability of production structural and semantic text analysis.	10									v						
3	Physical culture	The purpose of the discipline is to master the forms and methods	8									v						

		of forming a healthy lifestyle within the framework of the professional education system. Familiarization with the natural-scientific basics of physical education, knowledge of modern health-improving technologies, basic methods of independent physical education and sports. As part of the course, the student will master the rules of judging in all sports.																	
4	Information and Communication technology	Goal: Students will master the basics of information processes, modern technologies and data protection methods within the discipline of information and communication technologies. Contents: Study of text and spreadsheet editors, databases, introduction to the Python programming language. Additionally - the basics of network technologies, data transfer protocols, information security and setting up operating systems. Practical classes include labs on setting up network connections, working with databases, and developing programs in Python.	5			v						v							
5	History of Kazakhstan	The purpose of the discipline is to provide objective historical knowledge about the main stages	5									v							

		of the history of Kazakhstan from ancient times to the present day; introduce students to the problems of the formation and development of statehood and historical and cultural processes; contribute to the formation of humanistic values and patriotic feelings in the student; teach the student to use the acquired historical knowledge in educational, professional and everyday life; evaluate the role of Kazakhstan in world history.																	
6	Philosophy	The purpose of the discipline is to teach students the theoretical foundations of philosophy as a way of knowing and spiritually mastering the world; developing their interest in fundamental knowledge, stimulating the need for philosophical assessments of historical events and facts of reality, assimilating the idea of the unity of the world historical and cultural process while recognizing the diversity of their skills in applying philosophical and general scientific methods in professional activities.	5										V						
7	Module of socio-political knowledge (sociology, political science)	The objectives of the disciplines are to provide students with explanations on the sociological analysis of society, about social	3										V						

		communities and personality, factors and patterns of social development, forms of interaction, types and directions of social processes, forms of regulation of social behavior, as well as primary political knowledge that will serve as a theoretical basis for understanding social -political processes, for the formation of political culture, development of a personal position and a clearer understanding of the extent of one's responsibility; help to master the political, legal, moral, ethical and socio-cultural norms necessary to act in the interests of society, form personal responsibility and achieve personal success.																	
8	Module of socio-political knowledge (cultural studies, psychology)	The purpose of the disciplines is to study the real processes of cultural creative activity of people who create material and spiritual values, identify the main trends and patterns of cultural development, changes in cultural eras, methods and styles, their role in the formation of man and the development of society, as well as master psychological knowledge for the effective organization of interpersonal	5									V							

		interaction, social adaptation in the field of their professional activities.																	
Cycle of general education disciplines Component of choice																			
9	Fundamentals of anti-corruption culture and law	Purpose: to increase the public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Contents: Content: improvement of socio-economic relations of the Kazakh society, psychological features of corrupt behavior, formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields.	5	v								v							
10	"Fundamentals of scientific research methods"	Purpose: to form knowledge about scientific research, methods and methodology of scientific research, methods of collecting and processing scientific data in modern science. Contents: fundamentals of the theory of solving inventive problems, with algorithmic methods of searching for technical solutions and their optimization, basic mathematical optimization methods, the use of artificial intelligence capabilities	5					v		v									

		to solve optimization problems, issues of search, accumulation and processing of scientific information.																	
11	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5								v								v	
12	Fundamentals of economics and entrepreneurship	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.	5										v							
13	Ecology and life	Purpose: formation of ecological	5																v	

	safety	knowledge and consciousness, obtaining theoretical and practical knowledge on modern methods of rational use of natural resources and environmental protection. Contents: the study of the tasks of ecology as a science, the laws of the functioning of natural systems and aspects of environmental safety in working conditions, environmental monitoring and management in the field of its safety, ways to solve environmental problems; life safety in the technosphere, emergencies of a natural and man-made nature.																	
Cycle of basic disciplines University component																			
14	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several	5									V							

		variables. Partial derivatives. The extremum of a function of two variables.																	
15	Physics	Purpose: To form ideas about the modern physical picture of the world and scientific worldview, the ability to use knowledge of fundamental laws, theories of classical and modern physics. Contents_ physical fundamentals of mechanics, fundamentals of molecular physics and thermodynamics, electricity and magnetism, vibrations and waves, optics and fundamentals of quantum physics.	5									v							
16	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations.	5									v							

17	Discrete Mathematics	The discipline deals with coding theory, set theory, graph theory, mathematical logic. Namely, the foundations of coding theory, set theory, graph theory; theory of logic algebra; mathematical apparatus for the synthesis and analysis of digital devices, transform Boolean functions, synthesizing minimal combinational circuits; performing coding.	5				v					v						
18	Algorithmization and programming basics	The course explores the fundamental concepts of programming: operator, variable, procedure, function, data type. The main structures of algorithms are considered, such as linear, branched, cyclic. The course examines the basic forms of data representation: strings, structures, arrays, lists. Separate topics are devoted to the creation of widely used sorting algorithms, searching for the minimum and maximum values in an array, string processing, iterative and recursive algorithms, building flowcharts of algorithms and developing programs based on them.	4				v												
19	Introduction to Web programming	The course is designed to learn the basics of Web programming and Web application	5													v			

		development. The course includes topics such as the basics of functioning, configuration and administration of software that implements Internet services; HTML 5 markup language; the basics of web page layout using CSS; fundamentals of the JavaScript language and frameworks jQuery, AngularJS; basic web page design patterns; basics of server languages; database technologies.																	
20	Algortihms and Data Structures	The course covers the main approaches to the analysis and design of algorithms and data structures. The course covers topics such as worst-case asymptotic estimation of algorithm complexity, efficient algorithms for sorting and choosing order statistics, data structures (binary search trees, heaps, hash tables), algorithm design techniques (divide and conquer, dynamic programming, greedy strategy), basic algorithms on graphs (shortest paths, topological sorting, connected components, minimum spanning trees).	5				v												
21	Object oriented programming	The course covers topics such as: the paradigm of object-oriented programming; classes and	5				v												

		objects; principles of creating scalable software using a high-level method for designing business environment concepts in a programming language; programming languages C++, Java and C#; principles of abstractions, encapsulation, inheritance, polymorphism; software design patterns; practical skills in creating software products.																	
22	Computer architecture and consistency of operations	The program of the course is devoted to the study of the architecture of computer systems, interaction and control of processes, the principles of building hardware and software and their interaction in the process of input, processing and output of information in modern computer systems.	5											v					
23	Artificial intelligence	Objective: to study the field of computer science dedicated to the creation of intelligent systems capable of imitating human thinking. Contents: the history of AI development, methods and algorithms such as machine learning, neural networks, optimization algorithms and much more. Theory and practical skills for the creation and application of	5								v								

		artificial intelligence in various fields.																
24	Application design patterns	Goal: Students will be exposed to simple and elegant solutions to common problems encountered in object-oriented design, as well as the opportunity to bring together all the agile development techniques and show how they work. Learn to use UML to create diagrams that cover various aspects of applications. Contents: understand the concepts of object-oriented design, be able to read and analyze UML diagrams, be able to design class, state, activity and other diagrams, understand the intricacies of the UML language, be able to design class hierarchies based on OOP.	4												v			
25	Databases	The course studies the basic concepts of data warehouses, types of storages. The course deals with practical aspects related to the definition of physical and conceptual data models, the differences between them and approaches to solving problems of building databases. Various types of data storage are discussed, algorithms for organizing effective access to data and delimiting access rights	5															v

		to data are studied. The main part of the course focuses on the relational data model and the SQL language.																	
26	Operating systems	Content: The purpose of studying the discipline is to acquire the primary skills necessary for studying system programming and operating system administration, including the skills of configuring and analyzing operating systems. Special attention will be paid to the three main subsystems of operating systems: process management (processes, threads, CPU scheduling, synchronization and deadlocks), memory management (segmentation, pagination, paging), file systems and operating system support for	5										v						
27	Information security and data protection	The course is devoted to the main aspects of information security and is aimed at studying the theoretical foundations and practical use of information security systems in information systems, systematically gaining knowledge about the principles, methods and means of implementing data protection, acquiring practical skills in information security in	5			v													

		information systems necessary for their design and operation.																
28	Computer Networks	The program of the training course is aimed at familiarizing students with the basics of organization, construction, architecture and principles of functioning of computer networks. The course focuses on the application of skills to the organization of real networks and examines the communication tools, protocols and standards of networks. As a result of mastering the discipline, students will learn how to configure and configure communication tools, select firewalls, and operate computer networks.	5		v													
Cycle of basic disciplines Component of choice																		
29	Mathematics and Statistics	The course deals with mathematical models, methods and tools of linear algebra, mathematical analysis and probability theory, which are used in software engineering and the field of artificial intelligence. The issues of mathematical formalization of applied problems, the use of adequate mathematical tools in solving specific engineering and technical problems,	5								v	v						

		mathematical modeling and interpretation of the obtained quantitative and qualitative results of solving these problems are considered.																	
30	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5								v								
31	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial	5									v							

		designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.																	
32	Data Visualization	Goal: To provide students with the skills and knowledge to visualize data to effectively present and analyze information. Content: Study the basic principles and techniques of data visualization, including the selection of appropriate graphical tools and techniques for presenting information. Analysis of successful cases and creation of your own visualizations for various types of data and analysis tasks. Learn to use specialized tools and libraries to create interactive and informative visualizations.	5					v											
33	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the	5									v					v		

		implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.																	
Cycle of profile disciplines University component																			
34	Enterprise Web Programming	MVC models based on high-level languages are studied. Application technologies with state-preserving and non-state-preserving client connections are studied. Various mechanisms of code reduction and reuse are considered. The questions of authentication and authorization, access to data and operations on them are considered.	4													V			
35	UX/UI design	The course covers UX design, the concept of design thinking, and UX research. The course is aimed at studying the user of the software product, User-flow, Use-cases. The methods of prototyping using characters, general principles of interface design, design methods, site design, site typology, E-commerce, working with forms, mobile application development, text in the interface, Front-end for the designer, Visual Design,	5													V			

		the basics of proper communication for designer, communication with the client, communication within the team, organization of the UX process, presentation of the UX project, portfolio design are considered.																	
36	Start up and Technological Entreprenurship	Goal: Formation of theoretical knowledge and practical skills in the field of technological entrepreneurship and management of innovative projects, including their development, implementation and implementation. Content: The course includes practical elements such as developing business models, conducting market research, implementing product development cycles and raising seed capital. The training is aimed at preparing students to successfully manage innovative projects and launch their own startups.	5												V				
37	IT project management	Goal: To develop students' professional competencies in effective management of IT projects, including the use of project management information systems. Contents: Study of basic methods and tools of computer-aided design, modern standards and methodologies of	5												V				

		project management, principles of standardization in the field of project management, as well as consideration of functions and examples of project data management systems.																
38	IT infrastructure	The objectives of the discipline are teaching theory, methods and technologies in the field of development and management of IT infrastructure, management and development of IT infrastructure of various profiles and scales, as well as the formation of practical skills for the effective construction and modernization of IT infrastructure. Includes topics on modern technologies, methods and tools used in IT infrastructure management, IT infrastructure design methods for an enterprise, enterprise business architecture modeling, basic methods for modeling IT department business processes, optimizing the work of an IT department.	5		v												v	
39	Business Intelligence	Within the framework of the discipline, the basics of Microsoft Business Intelligence, MS BI components (SSIS, SSAS, SSRS), architecture and user interface, analytical problem solving based on MS BI are studied. The course	5							v								

		starts with basic concepts related to business intelligence and multidimensional modeling. To create, edit, organize analytical queries to MS SQL, SSIS, integration service and SSRS, reporting service, the Microsoft BI user interface in Visual Studio and SSAS is used.																	
40	Capstone project	Goal: To prepare students for the research and development (R&D) cycle, from conceptual planning and analysis of an engineering project through project completion. Content: Includes practice in project documentation, formal presentations, oral project defense, and final report writing. Introduces technical methods of analysis, design, prototyping, synthesis, troubleshooting, and testing of integrated systems to create a software product.	5												v	v			
Cycle of profile disciplines Component of choice																			
41	1C Configuration	Purpose: The course studies the mechanisms of the 1C:Enterprise platform. The work with platform mechanisms is demonstrated by the example of solving a training task similar to tasks in real enterprises. Content: Topics such as operational accounting, accounting, complex	5													v			v

		periodic calculations, business process mechanisms, managed data locks during document processing will be considered. Mastering the course will allow students to understand the principles of building the 1C: Enterprise system and master the tools of the configurator and the skills to work with the system.																	
42	Advanced Algorithms I	Within the framework of the discipline in-depth aspects of the construction of algorithms and the effectiveness of the solution are considered. Topics include solving NP complex problems, asymptotic estimation of algorithm complexity, efficient sorting algorithms, data structures (binary search trees, heaps, hash tables), ways of designing algorithms (divide and conquer, dynamic programming, greedy strategy), basic algorithms on graphs (shortest paths, topological sorting, connected components, minimum spanning trees).	5				v												
43	Advanced Algorithms II	Within the framework of the discipline, simple data structures are studied: singly and doubly linked lists, stack, queue, dec; binary and k-ary heaps; binomial heaps; hashing; polynomial hash;	5				v												

		hash tables with open and closed addressing; strategies for deleting elements and scaling tables; Bloom filter; binary search trees; balanced trees; cartesian tree; 2-3 trees and B-trees.																	
44	Advanced Algorithms III	Within the framework of the discipline, graph theory is studied; depth-first and breadth-first searches, topological sorting, strongly connected components; bridges and articulation points; components of edge and vertex biconnectivity; shortest paths in weighted graphs; Ford-Bellman, Floyd-Warshall and Dijkstra algorithms; the minimum spanning problem; safe edge lemma; Prim's, Boruvka's and Kruskal's algorithms.	5				v												
45	Advanced Algorithms IV	Within the framework of the discipline, classes of problems L, P, NP, co-NP, NPC, co-NPC, PSPACE, EXPTIME, BPP, ZP, RP are studied; some correlations of these classes; P = NP problem, Cooke-Levin theorem; NP-completeness of some problems.	5				v												
46	Analysis and processing of web data	The objectives of mastering the discipline are to form the formation of students' theoretical knowledge and practical skills	5					v			v								

		for analyzing data received from the Internet. Within the framework of the goal set, the task of the academic discipline is to master theoretical knowledge and acquire practical skills for obtaining and processing data from sites of various contents, as well as interpreting the results obtained.																	
47	Introduction to Data Science	Purpose: to teach students the basic concepts and methods of data analysis, as well as practical skills of working with data to solve real-world problems. Content: During the course, students will study the processes of collecting, cleaning, analyzing and visualizing data, master the methods of statistics and machine learning, as well as learn how to use popular tools and technologies. Special attention will be paid to the application of data science in various fields.	5					v			v								
48	Deep learning	Goal: Master the basics of deep learning for effective data analysis and creation of intelligent systems. Contents: Learning the basics of neural networks and their application in machine learning. Analysis of deep learning architectures and	4								v								

		optimization methods. Develop practical skills in processing image and text data using deep neural networks.																	
49	Green technologies	The purpose of teaching the discipline is to study the theoretical foundations of "green" technologies and their main segments in order to develop practical skills in the use of ICT to ensure the Sustainable Development Goals. The course reveals the essence of green technologies, information systems as a component of green technologies. The directions of green technologies are considered: 1) the introduction of renewable energy sources; 2) improvement of the waste management system; 3) improvement of the natural resource management system; 4) development of "clean" transport.	5															v	
50	Huawei ICT solutions	Purpose: The course provides knowledge about information and communications technology (ICT) Huawei infrastructure. Content: Huawei course is in accordance with the organization's "Platform + Ecosystem" development technique, and its new ICT	5														v		

		infrastructure highlighting "Cloud-Pipe-Device" synergy. Huawei comprises ICT solutions such as ICT Infrastructure, Platform and Service with its driving ability advancement system.																	
51	Computer graphics	The course studies the generation of images on a computer, namely the mathematical and algorithmic foundations of computer graphics, raster graphics algorithms, 2D and 3D modeling, polygonal models. The technologies of using the OpenGL graphics library for generating 2D and 3D images, the use of auxiliary libraries are considered. After studying the discipline, students will be able to master any graphic tools, continue to study and use graphic libraries.	5						v										
52	Computer vision	Goal: Formation of competencies in the development of XML-oriented web services on the Java SE platform, including knowledge, skills and abilities. Contents: Development of simple web services using JAX-WS and JAX-RS, creation of client applications for web services. Training in deploying and running applications with	4								v								

		web services, studying the basic principles and technologies of Java EE used in the development of web services.																
53	Machine Learning	Within the framework of the discipline, methods for analyzing large amounts of information, creating models for forecasting in business, medicine, and industry are studied. The issues of training a neural network, creating analytical systems and recommender services based on machine learning algorithms, natural language processing and/or computer vision are considered.	5								v							
54	Big data analysis and processing methods	Goal: Formation of competencies in the development of XML-oriented web services on the Java SE platform, including knowledge, skills and abilities. Contents: Development of simple web services using JAX-WS and JAX-RS, creation of client applications for web services. Training in deploying and running applications with web services, studying the basic principles and technologies of Java EE used in the development of web services.	4					v										
55	Cloud Computing	Purpose: students will master the basic concepts and methods of	5													v		

		cloud computing, familiarize themselves with critical technologies and trends in their development. Content: The course covers the architecture and design of cloud deployments, services and applications provided by the cloud, fundamental planning algorithms for resource management, as well as problems and challenges facing the full potential of cloud technologies. Students study virtualization techniques, security and privacy issues in the development and deployment of cloud applications.																
56	Natural Language Processing (NLP)	Purpose: to study methods and algorithms for understanding and generating human language, to create effective systems of interaction in natural language. Content: The course includes an introduction to NLP, linguistic fundamentals, probabilistic models and machine learning, text preprocessing, text analysis, syntactic and semantic analysis, as well as applications and ethical aspects.																
57	Reinforcement learning	Goal: To introduce students to the principles and methods of reinforcement learning (RL),	4								V							

		which aims to train agents to make decisions in an uncertain environment to maximize rewards. Contents: Includes the basics of probability theory, methods of machine learning and artificial intelligence, as well as the practical application of RL algorithms on control and optimization problems.																	
58	1C Programming	Purpose: Within the framework of the course, a theoretical framework is given, and solutions to specific problems are considered. The objects that are used to implement the business logic of any solutions operating on the 1C: Enterprise platform are studied. Content: Topics discussed include how to customize the system based on the needs of a particular organization, make changes to software solutions so that users can use them as efficiently as possible, tune databases, and update the system.	5														v			v
59	System Design	Purpose: to form students' understanding of the principles and methods of designing complex information systems. Content: The discipline covers topics such as introduction to system design, requirements	5		v															

		analysis, architectural styles and patterns, system architecture design, technologies and tools, scalability and performance, system security, redundancy and fault tolerance methods.																
60	Web Services Development	Goal: Students will master the principles and practices of creating, deploying and maintaining reliable and scalable web services that ensure effective interaction between various applications and systems. Contents: Development of simple web services with the study of Web services architecture, Protocols and data exchange formats, Development of RESTful web services. Students will also be shown the practices of developing SOAP web services, Authentication and authorization of other mechanisms used in the development of web services.	4													v		
61	Development of high-load systems	Goal: Teach students the key principles, algorithms and trade-offs that are essential when developing high-load systems for working with data. Contents: The discipline studies the analysis of problems that require modeling of highly loaded systems, the principles of operation of such	4													v	v	

		systems and their limitations. The analysis of software products designed to solve the problems of building highly loaded systems is also considered.																
62	Computer games development	Purpose: The course focuses on the basic methods of game design, development, documentation and implementation of the projects. Content: The course begins with a description of the General ideas of the development of computer games, game documentation. The first considers the creation of two-dimensional games, their example explores fair for all kinds of games concept, the second focuses on working with three-dimensional graphics. Both blocks are completed with the analysis of a fairly large-scale game project that demonstrates the interaction of technologies studied earlier.	4												v			
63	Mobile Programming	Goal: Mastering the skills of developing mobile applications for various platforms using modern tools and technologies. Contents: Fundamentals of mobile development, mobile application architecture, user interfaces (UI/UX) for mobile	5												v			

		devices, programming languages and development environments (for example, Swift, Kotlin), working with databases and APIs, state management and navigation, testing and debugging, publication and distribution of applications, practical projects for creating mobile applications.																	
64	Web application development	Goal: To familiarize the student with the basics of working with the document object model, which forms the basis for the dynamic formation and modification of the content of HTML pages, using the JavaScript programming language and the jQuery library. The basics of backend development of server-side programming web applications on different platforms (frameworks) are discussed. Contents: JavaScript basics and their application in front-end development. Learning the classic jQuery library and its use in AJAX. Basics for the server side of front-end applications. Consideration of various frameworks in the context of developing modern web applications.	5													V			

65	Theory of neural networks	The course studies the basics of the theory of neural networks. A neural network model is considered. A technique for constructing trained logical neural networks is given. The decision-making system based on the mathematical logic of events is analyzed. The technology of neural network training is presented. The course also discusses methods for developing and programming a decision-making model based on neural networks. Programming of simple neural networks is carried out.	5									v	v						
66	Augmented and virtual reality technologies	Purpose: to familiarize students with the basic concepts, methods and tools for developing AR and VR applications. Content: includes an introduction to AR and VR, technical fundamentals, software tools and platforms, visualization and interactivity techniques, tracking and positioning, application development, application of AR and VR in various fields, ethical and social aspects.	4													v			
67	Microservice Technologies	This course covers the fundamental concepts of microservices to help the student determine if this architectural	5													v			

		model is appropriate for system development by the development team. Student tasks - Learn about development methodologies - - Explain monolithic and micro service architecture - Agile/Scrum - - learn Smart endpoints and dump pipes.																	
68	Functional Programming	Within the framework of the discipline, functional programming languages are studied, the basic concepts of a functional approach to writing programs. The course outlines the basics of functional programming and methods of its application in solving complex problems at the intersection of artificial intelligence and system programming. Functional programming techniques are illustrated in the Lisp language, which has served as the basis for a wide range of research and applied developments.	5														v			
69	Emotional artificial intelligence	Purpose: to study the concept of emotional artificial intelligence (Affective computing & Social signal processing), methods of automatic recognition, analysis and synthesis of emotions and social behavior. Content: The course provides basic concepts from psychology and computer	5					v			v								

		science that are related to emotional artificial intelligence, knowledge of the methodology for automatic recognition, analysis and synthesis of emotions and social signals and forms practical skills for collecting and annotating data to build emotional artificial intelligence algorithms.																
70	Blockchain technologies	The purpose of mastering the discipline is to study blockchain technology, which allows the transfer and storage of digital assets in a decentralized way. In this course, the student will gain an understanding and knowledge of the basic concepts of blockchain technology, such as a transaction, block, block header and block chain, blockchain operations, verification, validation and consensus building, as well as the algorithms underlying the blockchain, as well as acquire the skills to develop and implementation of smart contracts, get acquainted with the methods of developing decentralized applications for blockchain networks.	5													v			
71	Computer Science & Engineering	Taking computer and engineering practice in the	5							v					v	v			

	Internship	laboratories of the Institute of Digital and Telecommunication Technologies. During the internship, students solve many problems in the field of IT. Thanks to the experience gained, students get acquainted with the practical application of higher-level programming languages, get acquainted with the structure and organization of the workflow.																
72	Computer Science & Engineering Internship II	Taking computer and engineering practice in the laboratories of the Institute of Digital and Telecommunication Technologies. During the internship, students solve many problems in the field of IT. Thanks to the experience gained, students get acquainted with the practical application of high-level programming languages, learn how to process a large amount of information using SQL, and also get acquainted with the structure and organization of the workflow.	5							v				v	v			
73	Computer Science & Engineering Internship III	Taking computer and engineering practice in the laboratories of the Institute of Digital and Telecommunication Technologies. During the internship, students solve many	5							v				v	v			

		problems in the field of IT. Thanks to the experience gained, students get acquainted with the practical application of high-level programming languages, learn how to process a large amount of information using SQL, and also get acquainted with the structure and organization of the workflow.																
74	Computer Science & Engineering Internship IV	Taking computer and engineering practice in the laboratories of the Institute of Digital and Telecommunication Technologies. During the internship, students solve many problems in the field of IT. Thanks to the experience gained, students get acquainted with the practical application of high-level programming languages, learn how to process a large amount of information using SQL, and also get acquainted with the structure and organization of the workflow.	5							v				v	v			
75	CRM systems	Goal: Training in the principles and practical aspects of using CRM systems to manage interactions with customers and improve business processes. Contents: Main components and functions of CRM systems, types of CRM (operational, analytical,	5							v								

		collaborative), the process of implementation and adaptation of CRM, customer data management, marketing automation, sales and service, integration with other business systems, review of popular CRM solutions, examples of successful application of CRM in business, practical skills in working with CRM systems.																
76	Data Mining	Purpose: to teach students the basic methods and algorithms of Data Mining to identify patterns in databases and make predictions. Content: The course covers issues related to the process of identifying, clearing knowledge in datasets, coding using various statistical methods and machine learning methods and visualization of constructed structures. The focus is on machine learning techniques and related technologies such as data storage and operational analytical processing (OLAP).	5					v			v							
77	DevOps for application development	Goal: Development of an innovative software product in the field of computer science and engineering to solve a specific problem or improve existing technologies. Contents: Includes requirements analysis,	5											v		v		

		architecture design, programming, testing and product optimization. Modern development methods and tools are used, and the principles of software safety and efficiency are taken into account.																	
78	Fintech technology	Goal: Study of modern technologies and their application in the field of financial services. Contents: Fundamentals of fintech, blockchain and cryptocurrencies, digital payment systems, algorithmic trading, artificial intelligence and machine learning in finance, regulatory aspects and security, fintech startups and innovations, data analysis and financial analytics, examples of implementation of fintech technologies, practical cases and projects in the field of financial technologies.	5					v			v							
79	NoSQL databases and application development	The purpose of studying the discipline is to study the main NoSQL databases: document-oriented, columnar, key-value, graph, etc. The course discusses the features of the built-in language of each type of database, methods for designing storage systems, methods for creating queries and optimizing	5												v			v	

		them for execution speed, features modern NoSQL solutions and comparative analysis of relational and NoSQL approaches. Issues of ensuring reliability, fault tolerance and scalability of databases are discussed.																	
80	ESG principles in inclusive culture	Purpose of the course: It focuses on studying ESG (Environmental, Social, Governance) principles and their interaction with the creation of an inclusive culture within an organization. Content: Students will gain knowledge on how implementing ESG principles contributes to corporate social responsibility, sustainable development, and equal opportunities for all employees, including those who may face various forms of discrimination. The course will help students understand the importance of an inclusive culture in achieving long-term business goals and ensuring sustainable organizational development.	5								v		v						
81	Mathematical Optimization Methods	Purpose: To study fundamental optimization methods applied in computational mathematics, engineering, and data analysis. Content: Convex and non-	5		v							v							

		convex optimization, gradient-based methods (gradient descent, Newton's method, quasi-Newton methods), linear and nonlinear programming, stochastic optimization methods, numerical techniques for solving optimization problems, application of optimization algorithms in computational tasks.																
82	Numerical methods and programming	Purpose: to study the basic techniques of developing and applying in practice methods for solving various mathematical problems arising both in theory and in applications to various fields of mathematics, physics, mechanics, chemistry, etc. Contents: computational error; concepts of approximation, stability, convergence of the algorithm; methods of root localization; iterative methods for solving SLAE; interpolation; numerical differentiation, integration; numerical methods for solving the Cauchy problem for ODEs.	5		v		v									v			
83	Law basics	The purpose of the study: To attain knowledge in legal sphere in order to use them effectively in engineering activity; To make students know about efficient	5									v						v	

		management of a work collective basing on legal mechanisms. Short content: the course allows students to get knowledge about specified directions of law, to organize information about subject and object of legal relations, about the main institutes and functions of legal directions. Expected results: After the course studying students should know, how to use legal norms in particular situations, how to make necessary documents and how to use special legal measures to restore broken rights.																

5. Curriculum of educational program

NON-PROFIT JOINT STOCK COMPANY
"KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATBAYEV"

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year	**2025-2026 (Autumn, Spring)**
Group of educational programs	**B057 - "Information technologies"**
Educational program	**6B06102 - "Computer Science"**
The awarded academic degree	**Bachelor of information and communications technologies**
Form and duration of study	**full time - 4 years**

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites
									1 course		2 course		3 course		4 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5								
LNG111	Technical English Elementary 1		GED, RC	5	150	0/0/45	105	E	5								
LNG111	Technical English Elementary 1		GED, RC	5	150	0/0/45	105	E		5							
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5							
M-2. Module of physical training																	
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2								
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2							
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2					
M-3. Module of information technology																	
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E			5						
M-4. Module of socio-cultural development																	
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE				5					
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E							5		
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E							3		
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E								5	
M-5. Module of anti-corruption culture, ecology and life safety base																	
HUM159	Law basics	1	GED, CCH	5	150	30/0/15	105	E					5				
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E					5				
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E					5				
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5								
PHY468	Physics		BD, UC	5	150	15/15/15	105	E	5								
MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5							MAT101
CSE603	Discrete Mathematics		BD, UC	5	150	30/0/15	105	E		5							MAT102, CSE616
M-7. Module of basic training																	

CSE662	Introduction to Web programming		BD, UC	5	150	15/15/15	105	E	5								CSE155
CSE554	Algorithmization and programming basics		BD, UC	4	120	15/15/15	75	E	4								
CSE678	Algortihms and Data Structures		BD, UC	5	150	15/15/15	105	E		5							
AAP173	Practical training		BD, UC	2				R		2							
CSE127	Object oriented programming		BD, UC	5	150	15/15/15	105	E			5						CSE164, MAT101
CSE676	Computer architecture and consistency of operations		BD, UC	5	150	15/15/15	105	E			5						CSE195
CSE608	Mathematics and Statistics	1	BD, CCH	5	150	30/15/0	105	E			5						
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E			5						
CSE880	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	30/0/15	105	E			5						
CSE679	Databases		BD, UC	5	150	15/15/15	105	E				5					CSE155
CSE844	Artificial intelligence		BD, UC	5	150	30/15/0	105	E				5					
CSE845	Application design patterns		BD, UC	4	120	15/0/30	75	E				4					
CSE869	Operating systems		BD, UC	5	150	30/15/0	105	E				5					
CSE122	Computer Networks		BD, UC	5	150	15/15/15	105	E					5				CSE677
SEC162	Information security and data protection		BD, UC	5	150	30/15/0	105	E					5				
IDD427	Ecology and life safety	1	BD, CCH	5	150	30/0/15	105	E						5			
HUM158	The basics of anti-corruption culture	1	BD, CCH	5	150	30/0/15	105	E						5			
ELC811	Fundamentals of scientific research	1	BD, CCH	5	150	30/0/15	105	E						5			
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	1	BD, CCH	5	150	30/0/15	105	E						5			
CSE847	Data Visualization	1	BD, CCH	5	150	15/0/30	105	E						5			
MAT456	Numerical methods and programming	1	BD, CCH	5	150	15/0/30	105	E						5			
CHE950	ESG principles in inclusive culture	1	BD, CCH	5	150	30/0/15	105	E						5			
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-8. Module of professional activity																	
CSE513	UX/UI design		PD, UC	5	150	15/15/15	105	E			5						
CSE674	Functional Programming	1	PD, CCH	5	150	30/15/0	105	E			5						CSE155
CSE860	Web application development	1	PD, CCH	5	150	15/0/30	105	E			5						
AAP102	Production practice I		PD, UC	2				R				2					
CSE632	Enterprise Web Programming		PD, UC	4	120	15/15/15	75	E					4				CSE403
CSE178	Machine Learning	1	PD, CCH	5	150	15/15/15	105	E					5				CSE439, CSE446
CSE636	Mobile Programming	1	PD, CCH	5	150	15/15/15	105	E					5				CSE127
CSE537	Computer graphics	1	PD, CCH	5	150	15/15/15	105	E					5				
CSE182	Cloud Computing	2	PD, CCH	5	150	30/15/0	105	E					5				CSE157, CSE101, CSE453
CSE623	Computer Science & Engineering Internship	2	PD, CCH	5	150	0/0/45	105	R					5				
CSE653	Advanced Algorithms I	2	PD, CCH	5	150	0/0/45	105	R					5				
CSE691	Blockchain technologies	2	PD, CCH	5	150	30/0/15	105	E					5				
CSE861	1C Programming	2	PD, CCH	5	150	0/0/45	105	E					5				
AAP183	Production practice II		PD, UC	3				R						3			
CSE855	Start up and Technological Entreprenurship		PD, UC	5	150	15/0/30	105	E						5			
CSE849	Development of high-load systems	1	PD, CCH	4	120	15/0/30	75	E						4			
CSE850	Deep learning	1	PD, CCH	4	120	30/15/0	75	E						4			
CSE868	Computer games development	1	PD, CCH	4	120	30/15/0	75	E						4			
CSE851	Web Services Development	2	PD, CCH	4	120	15/0/30	75	E						4			

CSE852	Computer vision	2	PD, CCH	4	120	15/0/30	75	E						4			
CSE853	Big data analysis and processing methods	2	PD, CCH	4	120	30/15/0	75	E						4			
CSE634	Theory of neural networks	3	PD, CCH	5	150	15/15/15	105	E						5			CSE617
CSE837	DevOps for application development	3	PD, CCH	5	150	15/15/15	105	E						5			
CSE862	Natural Language Processing (NLP)	3	PD, CCH	5	150	30/15/0	105	E						5			
CSE871	Introduction to Data Science	3	PD, CCH	5	150	30/15/0	105	E						5			
CSE654	Advanced Algorithms II	4	PD, CCH	5	150	0/0/45	105	R						5			
CSE658	Computer Science & Engineering Internship II	4	PD, CCH	5	150	0/0/45	105	R						5			
CSE504	Green technologies	4	PD, CCH	5	150	30/0/15	105	E						5			
CSE863	1C Configuration	4	PD, CCH	5	150	0/0/45	105	E						5			
CSE873	Data Mining	4	PD, CCH	5	150	15/0/30	105	E						5			
CSE643	Business Intelligence		PD, UC	5	150	15/15/15	105	E							5		
CSE516	IT infrastructure		PD, UC	5	150	15/0/30	105	E							5		
CSE839	IT project management		PD, UC	5	150	15/0/30	105	E							5		
CSE856	Reinforcement learning	1	PD, CCH	4	120	30/15/0	75	E							4		
CSE867	Augmented and virtual reality technologies	1	PD, CCH	4	120	30/15/0	75	E							4		
CSE872	Microservice Technologies	1	PD, CCH	4	120	15/0/30	75	E							4		
CSE655	Advanced Algorithms III	2	PD, CCH	5	150	0/0/45	105	R							5		
CSE659	Computer Science&Engineering Internship III	2	PD, CCH	5	150	0/0/45	105	R							5		
CSE519	Fintech technology	2	PD, CCH	5	150	15/15/15	105	E							5		
CSE864	Huawei ICT solutions	2	PD, CCH	5	150	15/15/15	105	E							5		
CSE878	Mathematical Optimization Methods	2	PD, CCH	5	150	15/0/30	105	E							5		
CSE842	Capstone project		PD, UC	5	150	0/0/45	105	E								5	
CSE690	Analysis and processing of web data	1	PD, CCH	5	150	15/15/15	105	E								5	
CSE865	Emotional artificial intelligence	1	PD, CCH	5	150	30/0/15	105	E								5	
CSE866	System Design	1	PD, CCH	5	150	15/0/30	105	E								5	
CSE660	Computer Science&Engineering Internship IV	2	PD, CCH	5	150	0/0/45	105	R								5	
CSE698	NoSQL databases and application development	2	PD, CCH	5	150	15/15/15	105	E								5	
CSE520	CRM systems	2	PD, CCH	5	150	15/15/15	105	E								5	
CSE656	Advanced Algorithms IV	2	PD, CCH	5	150	0/0/45	105	R								5	
M-9. Module of final attestation																	
ECA103	Final examination		FA	8												8	
Additional type of training (ATT)																	
AAP500	Military training																
Total based on UNIVERSITY:									31	29	32	28	29	31	32	28	
									60		**60**		**60**		**60**		

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	51	0	5	56
BD	Cycle of basic disciplines	0	75	10	85

PD	Cycle of profile disciplines	0	39	52	91
Total for theoretical training:		**51**	**114**	**67**	**232**
FA	Final attestation				8
TOTAL:					**240**

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 4 dated 22.11.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs	Uskenbayeva R. K.
Approved:	
Vice Provost on academic development	Kalpeyeva Z. B.
Head of Department - Department of Educational Program Management and Academic-Methodological Work	Zhumagaliyeva A. S.
acting Director of Institute - Institute of Automation and Information Technologies	Chinibayev Y. G.
Department Chair - Software Engineering	Abdoldina F. .
Representative of the Academic Committee from Employers ____Acknowledged____	Konysbayev A. T.