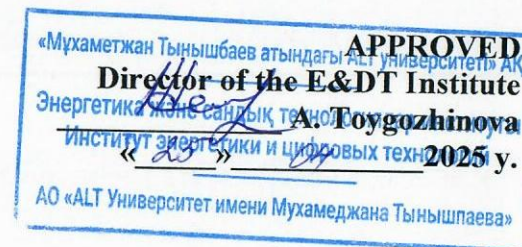


Deputy Director General ICT
KN of the MIAR RK, professor, PhD
Mamyrbayev O.Zh.

« 18 » 2025 y.



EDUCATIONAL PROGRAM
Duration of study: 4 years

6B06172 - Big Data Technology
Admission year: 2025

Level of education: Bachelor's degree

Cycle	Component	Name of discipline	Total labor intensity		Semester	Learning outcomes	Brief description of the discipline	Prerequisites	Postrequisites
			in academic hours	in academic credits					
1	2	3	4	5	6	7	8	9	10
Module of economic and managerial competencies									
OOD	CV	Ecologically sustainable technologies	150	5	4	PO12	The "Environmentally Sustainable Technologies" course explores modern methods and innovative solutions aimed at minimizing the negative impact of human activity on the environment. The course examines the principles of sustainable development, energy-saving technologies, renewable energy sources, waste management strategies, and environmentally friendly production processes.	Basic school knowledge of ecology	Industrial Internship 1, Industrial Internship 2
OOD	CV	Methods of scientific research				PO12	The course introduces the fundamentals of scientific activity, covering its goals, methods and forms, promoting the formation of theoretical knowledge and practical skills necessary for the successful conduct of scientific research in the chosen professional field, as well as developing the ability to independently search, analyze and apply scientific information, which becomes an important basis for further research and professional activity.	Natural Science Module, Educational Practice	Industrial Internship 1, Industrial Internship 2, Final Certification
OOD	CV	Green Economy and				PO11	The "Green Economy and Sustainable	Social and political	Managerial Economics,

		Sustainable Entrepreneurship					Entrepreneurship" course explores environmentally oriented economic models and business strategies aimed at sustainable development. The course examines green economy concepts, ESG (Environmental, Social, and Governance) approaches, the circular economy, sustainable business models, and their impact on global markets.	knowledge module	Time Management
OOD	CV	Fundamentals of Law and Anti-Corruption Culture				PO11	This course covers fundamental legal concepts, the constitutional structure of government in the Republic of Kazakhstan, the rights and freedoms of citizens enshrined in the Constitution, and the mechanisms for protecting an individual's legitimate interests in the event of their violation. This course develops students' social and individual legal awareness and legal culture, as well as a system of knowledge and civic stance on combating corruption as an antisocial phenomenon.	Social and political knowledge module	Managerial Economics, Time Management
OOD	CV	Digital inclusion				PO1	The "Digital Inclusion" course explores the principles of ensuring equal access to digital technologies and information for all social groups, including people with disabilities. The course examines barriers to digital inequality, strategies for overcoming them, technologies for adapting the digital environment, and government initiatives for developing an inclusive digital society.	Basic school knowledge of computer science	Industrial practice 2
OOD	CV	Basics of financial literacy				PO12	This course is aimed at developing the ability to make informed financial decisions, plan income and expenses, assess risks, and effectively manage one's resources in a market economy. It explores basic knowledge in finance and sound money management, and examines concepts of the financial system, budget, banking products, lending, savings, investments, insurance, taxation, and protection from financial fraud.	Information and Communication Technologies, Discrete Mathematics	Managerial economics
Professional module									
BD	CV	Fundamentals of Computer Networks and Telecommunications (Cisco)	150	5	4	PO5	This course examines key aspects of networking technologies, including the OSI and TCP/IP models, network types (LAN, WAN), network devices, and routing and switching protocols. Students gain an	Fundamentals of Algorithmization and Programming	Web Application Security, Object-Oriented Programming, Final Certification

							understanding of network infrastructure operating principles, as well as how to configure and troubleshoot network devices using Cisco equipment. Students acquire practical skills in configuring, administering, and troubleshooting networks using Cisco equipment and technologies.		
BD	CV	Fundamentals of Computer Networks and Telecommunications (Huawei)				PO5	Students master the principles of building and operating local, regional, and global computer networks and mobile telecommunications, as well as gain practical skills in working with their information resources, working with Cisco and Huawei networks, SD-WAN, and SDN. Active learning methods are "simulation-based" teaching methods, i.e., aimed at developing specialized knowledge, skills, and abilities: situational tasks, error detection methods, project-based methods, case studies, and open and closed tests.	Fundamentals of Algorithmization and Programming	Web Application Security
BD	CV	Intelligent applications for working with big data				PO8	This course focuses on mastering key methods for intelligent big data processing using machine learning and data analysis models. Students apply popular algorithms and tools to solve practical problems.	Information and communication technologies	Network Security, Network Programming
BD	CV	Big Data in the Internet of Things	150	5	6	PO4	This course explores the interaction and integration of big data and the Internet of Things (IoT) technologies. Students learn methods for collecting, storing, processing, and analyzing data from devices and sensors.	Information and communication technologies	Network Security, Network Programming
BD	CV	Web interface development technology				PO5	This course focuses on creating modern, user-friendly, and effective user interfaces for web applications and websites. Students learn HTML, CSS, JavaScript, and popular web frameworks.	Fundamentals of Algorithms and Programming, Java Programming	Industrial Internship 2, Final Certification
BD	CV	Natural language processing	120	4	7	PO3 PO4	This course focuses on methods for analyzing and processing natural language texts using artificial intelligence technologies and computer systems. Students are introduced to the main tasks of natural language processing (NLP), such as syntactic and semantic analysis, information extraction, sentiment detection, and machine translation. They explore algorithms and tools (such as NLTK and SpaCy), and engage in practical work with texts and machine	Fundamentals of Algorithms and Programming, Fundamentals of Computer Networks and Telecommunications (Cisco), Fundamentals of	Cloud Computing Security, Final Certification

							learning and artificial intelligence models.	Computer Networks and Telecommunications (Huawei)	
BD	BD	Data quality management and data governance technologies	120	4	6	PO9	This course focuses on methods for ensuring data quality and effective management. It examines issues that arise during the creation, collection, transfer, loading, use, and maintenance of data, as well as solutions.	Computer information security technologies	Final certification
BD	BD	Cloud computing and containerization				PO9, PO10	This course focuses on cloud computing architectures and containerization technologies such as Docker and Kubernetes. Students learn how to deploy, scale, and manage applications in a cloud environment.	Databases and Database Security, Operating Systems and OS Security, Identity and Access Management (IAM)	Final certification
BD	BD	Integrated Big Data Practice	120	4	7	PO3 PO4 PO7	The course focuses on practical mastery of the full cycle of working with big data: collection, storage, processing, analysis, and visualization. Students complete real-world projects, develop teamwork skills, and apply technology in real-world applications.	Cryptography and Security Protocols Identity and Access Management (IAM)	Final certification
BD	BD	Deep learning				PO10	This course covers neural networks and modern deep learning architectures, such as convolutional neural networks (CNNs), recurrent neural networks (RNNs), and transformers. Students learn how to build, train, and apply these models to real-world problems.	Intrusion Prevention and Detection Systems	Final certification
Module of economic and managerial competencies									
BD	CV	Managerial economics	90	3	3	PO11	Developing a conceptual framework and skills in economic analysis using modern models and principles of economic science, and examining economic problems and challenges facing business leaders. This course will enable students to acquire and develop knowledge in analytical research of economic, technological, and technical parameters of an enterprise, as well as master the application of specialized methods for economic justification of management decisions and assessing their consequences.	Green Economy and Sustainable Entrepreneurship	Minor Program 2
BD	CV	Time management				PO11 ,	This course explores a system of methods and principles of effective time management. The course	Green Economy and Sustainable	Minor Program 2

						PO12	covers planning techniques, prioritization, combating procrastination and stress, and strategies for increasing personal and professional productivity. Particular attention is paid to practical tools—from classic matrices to modern digital solutions.	Entrepreneurship	
Professional module									
PD	CV	Data Engineering Internship	120	4	7	PO7	This course is designed to provide practical experience in data engineering. Students are introduced to key data engineering tasks: extracting, transforming, loading, and storing data. The practical training utilizes programming languages (e.g., Python, SQL), ETL tools, and cloud technologies.	Operating systems and OS security	Intrusion Prevention and Detection Systems
PD	CV	Creation and maintenance of a big data platform				PO4	This course covers the design, deployment, and maintenance of big data platforms. Students explore key technologies such as Hadoop, Spark, and Kafka, and master approaches to building reliable and scalable systems.	Introduction to Information Security	Intrusion Prevention and Detection Systems
PD	CV	Big data storage technologies	120	4	7	PO4 PO5	This course explores architectures and methods for efficiently storing large volumes of data. It covers data warehouses, distributed file systems (such as HDFS), cloud storage, and NoSQL technologies. The course includes hands-on training with relevant tools.	Databases and Database Security, Python Programming Language, Identity and Access Management (IAM)	Intrusion Prevention and Detection Systems, Cloud Computing Security
PD	CV	Machine learning and neural networks				PO6	The course covers the basic concepts and algorithms of machine learning, as well as methods for applying them to real-world problems. Special attention is paid to neural network architectures and deep learning methods. The practical portion utilizes tools such as TensorFlow and PyTorch.	Personal data protection, Identity and access management (IAM)	Intrusion Prevention and Detection Systems
PD	CV	Data Mining Technologies (Limited)	120	4	7	PO5	This course focuses on methods for extracting knowledge from large volumes of data using artificial intelligence technologies. Students learn how to build models, identify patterns, forecast, and automate decision making using predictive analytics.	Python Programming Language, Identity and Access Management (IAM)	Artificial Intelligence Methods in Information Security, Final Certification
PD	CV	Stream data processing				PO4	This course covers the principles and technologies of working with real-time streaming data. Students learn methods for collecting, processing, storing, and analyzing data streams using modern tools such as	Fundamentals of Algorithmization and Programming, Data Visualization	Introduction to MongoDB, Final Assessment

							Apache Kafka and Spark Streaming.	Methods and Their Applications	
Practice-oriented module/Additional educational program module									
PD	CV	Data Cleansing Training	120	4	5	PO3 PO4	This course focuses on methods for detecting and eliminating errors, duplicates, and missing values in datasets. It also examines methods for standardizing, transforming, and improving data quality. Particular attention is paid to the practical application of data cleansing tools.	Information and Communication Technologies, Data Visualization Methods and Applications	Final certification
PD	CV	Hands-on training in building data platforms	120	4	6	PO3	This course is designed to develop practical skills in designing and building modern data platforms. Students explore the processes of storing, processing, integrating, and managing data using current technologies and tools.		
PD	CV	Data Analysis Training	120	4	7	PO4	The course focuses on learning data analysis methods and tools. Students master data exploration, visualization, and the application of statistical and analytical models to obtain meaningful conclusions. Particular attention is paid to practical assignments and real-world cases.	Python programming language	Introduction to MongoDB
PD	CV	Service to society	30	1	1	PO13	This course aims to develop students' understanding of social responsibility and the role of professionals in society. It examines the fundamental concepts of public service, ethical standards, and principles of interaction with various social groups. Particular attention is paid to developing the skills necessary for implementing projects and initiatives aimed at improving quality of life and solving social problems. During this course, students explore methods of engaging society in change processes and gain practical knowledge for effective social impact.		Final Assessment
PD	CV	Business communications				PO13	This course explores the principles and methods of effective communication in the business environment, aimed at achieving mutual understanding and successful interaction between organizations, employees, and society. Particular attention is paid to developing business communication skills, negotiation, presentation, and building a corporate culture that embraces social responsibility and ethical standards. Students will learn to apply communication technologies to build trust and collaboration, contributing to the sustainable development of business and society as a whole.		Final Assessment