

APPROVED

«Логистика және көлік академиясы» АҚ  
 «Автоматтандыру және телекоммуникациялар» институты  
 АО «Академия логистики и телекоммуникаций»  
 Институт «Автоматизация и телекоммуникации»

Director of the A&T Institute  
 A. Toygozhinova  
 2023

## CATALOG OF ELECTIVE DISCIPLINES

EDUCATIONAL PROGRAM

6B07120 –Automation and control

Education level: Bachelor's degree

Study period: 4 years

Year of admission: 2023

Module	Cycle	Component	Name of the discipline	Total labor intensity		Term	Educational outcomes	Brief description of the discipline	Prerequisites	Post-requirements
				in academic hours	in academic credits					
Module 3 – Environmental competencies	GFD	EC1	Ecology and life safety	150	5	3	EO2	The study of the basic environmental concepts, environmental problems and approaches to their solution, sources and types of environmental pollution by enterprises, the principles of standardizing the quality of atmospheric air and water, the main provisions of legislation in various fields, natural and man-made emergencies, their causes, methods of prevention and protection . Teaching methods - analysis of specific situations (case-study).	Basic school knowledge of ecology	Labor protection
Module 2 – Economic and managerial competencies		EC3	Basics of economics and entrepreneurship				EO2	He studies the activities of enterprises in various types of markets, the model of equilibrium and functioning of the market, state regulation of prices and tariffs. Considers the concept of entrepreneurship and the limits of its legal regulation, the conditions for the development of entrepreneurship, organizational and legal forms of doing business, business planning, entrepreneurial secrecy, social responsibility of. Active learning methods: case methods; business role-playing games, group work.	Socio-political knowledge module	Managerial Economics, Time Management
Module 1 – General education competencies		EC2	Scientific research methods				EO11	Obtaining theoretical and applied knowledge by students on the methods of scientific research of problems in the field of study, training of specialists with the skills of cognitive activity in the field of science, the formation of deep ideas about the content of scientific activity, its methods and forms of knowledge.	Socio-political knowledge module	Educational practice, Manufacturing practice 1, Manufacturing practice 2, Final certification
		EC4	Basics of law and anti-corruption culture	EO12	Improving the public and individual legal awareness and legal culture of students, as well as the formation of a system of knowledge and civil position to combat corruption as an anti-social phenomenon. As a result of studying the course, the student must master the fundamental concepts of law, the constitutional structure of the state power of the Republic of Kazakhstan, the rights and freedoms of citizens enshrined in the Constitution, the mechanism and protection of the legitimate interests of a person in case of their violation.	Socio-political knowledge module	Managerial Economics, Time Management			
Module 5 – Specialized competencies	BD	EC5	Linear-cable structures	180	6	6	EO4	It is aimed at studying the theory of guiding systems, the design and properties of communication lines (cable, fiber-optic lines and structured cable systems), mutual and external influences of communication lines, design and maintenance of communication lines.	Elements and devices of automation/ Technical means of automation,	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages



		EC6	Automation and telemechanics lines				EO4	It is aimed at studying electromagnetic processes in guiding systems, the design and characteristics of electric cables, the influence of external electromagnetic fields on the circuits of automation, telemechanics and communications of railway transport and protection measures.	Elements and devices of automation/ Technical means of automation,	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages
	BD	EC7	Computer and industrial networks	180	6	4	EO4	The study of the principles of construction, administration of computer networks and the formation of skills for configuring network devices. The discipline covers the study of the following issues: standardization of network solutions; hardware of computer networks; technologies for the construction and operation of local and global networks. Within the framework of the discipline, interactive teaching methods, Cisco Network Academy materials, Cisco Packet Tracer software emulator for laboratory classes are used.	Engineering Mathematics, Fundamentals of computer modeling, Digital electronics/Digital devices and microprocessors	Introduction to MongoDB, Machine Learning A-Z: Python & R in Data Science
		EC8	Wireless networking technologies and network security				EO4	Forms the skills of deploying a wireless communication system to ensure the security of data transmission. The discipline covers the study of the following issues: the basics of transmitting radio and light signals; the main devices of wireless networks and their security. Within the framework of the discipline, interactive teaching methods, Cisco Network Academy materials, Cisco Packet Tracer software emulator for laboratory classes are used.	Engineering Mathematics, Fundamentals of computer modeling, Digital electronics/Digital devices and microprocessors	Introduction to MongoDB, Machine Learning A-Z: Python & R in Data Science
	BD	EC9	Robot control systems	180	6	5	EO4	Mastering the basics of robotics, designing robots based on the Arduino complex and programming in the Arduino IDE development environment. Teaching methods are: problem solving, holding thematic colloquia, brainstorming seminars.	Engineering Mathematics, Fundamentals of computer modeling, Digital electronics/Digital devices and microprocessors	Introduction to MongoDB, Machine Learning A-Z: Python & R in Data Science
		EC10	Software testing				EO4	Formation of knowledge and skills on software quality control - verification and testing of software products. Active learning methods: case methods; business role-playing games, group work.	Engineering Mathematics, Fundamentals of computer modeling, Digital electronics/Digital devices and microprocessors	Introduction to MongoDB, Machine Learning A-Z: Python & R in Data Science
	BD	EC11	Modeling and identification of control objects	180	6	7	EO7	Studies mathematical methods for describing automatic control systems, the basics of linear regression analysis, solving problems of identification of nonlinear systems. Expanding and deepening knowledge of mathematics and the theory of automatic control to solve problems of structural and parametric identification, acquiring skills in using techniques and hardware and software modeling and technical diagnostics.	Microprocessor complexes in control systems	Final certification
		EC12	Modeling of objects of control systems				EO7	Studies the basics of modern computer technologies for solving mathematical modeling of control objects and technical calculations, methods and algorithms for solving engineering problems, the basics of working in the Matlab environment, working with the SIMULINK package, mathematical modeling of linear and nonlinear dynamic systems and devices.	Microprocessor complexes in control systems	Final certification
	BD	EC13	Digital electronics	180	6	3	EO1	Formation of students' understanding of digital electronics, the basics of digital circuitry, the principles of operation and design of digital devices. The course discusses the main methods of description and synthesis of logic circuits, modern means of developing digital devices.	Engineering Mathematics	Educational practice, Robot control systems/Software testing
		EC14	Digital devices and microprocessors				EO1	It is focused on the study of the theoretical and practical foundations of the functioning of digital devices and microprocessors in order to create schematic diagrams of communication devices and infocommunication technology. Within the framework of the discipline, interactive teaching methods, computational and analytical method, and the method of case tasks are used.	Engineering Mathematics	Educational practice, Robot control systems/Software testing



	BD	EC15	Elements and devices of automation	180	6	3	EO1	Acquisition of knowledge and practical skills on the elements of automation devices. Study of the device and principle of operation of transformers, generators and motors of various currents. Guest lectures of top managers are provided within the discipline.	Engineering Mathematics, Applied Physics	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages
		EC16	Technical means of automation				EO1	Mastering knowledge on elements of automation and telemechanics systems, including contactless elements, as well as technical possibilities of using system power supply devices. Guest lectures of top managers are provided within the discipline.	Engineering Mathematics, Applied Physics	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages
	PD	EC17	Basics of automation and track sensors	270	9	5	EO10	Acquisition of knowledge and practical skills in automation and telemechanics elements, including track sensors, contact systems of various types of relays, contactless elements and code-forming equipment at stations and stages. Guest lectures of top managers are provided within the discipline.	Applied Physics	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages
		EC18	Devices of technical means of automation				EO10	Mastering knowledge of elements of automation and telemechanics systems, including electromechanical relays and contactless elements, as well as ways to control remote objects. Guest lectures of top managers are provided within the discipline.	Applied Physics	Dispatch centralization, Station automation and telemechanics systems, Automatic fencing devices at stations and stages, Automation and telemechanics on stages
	PD	EC19	Automatic fencing devices at stations and stages	180	6	8	EO8	It is aimed at studying the principles of operation and device of automatic signaling at railway crossings, tunnel and collapse signaling, general requirements and recommendations for devices for monitoring the condition of rolling stock are given, and their basic electrical circuits at stations and stages are also considered.	Elements and devices of automation/ Technical means of automation, Basics of automation and track sensors, Devices of technical means of automation	Manufacturing practice 2, Final certification
		EC20	Signal autoregulation				EO8	It is aimed at studying the systems of signal auto-regulation in railway transport, automatic speed reduction or stopping of a train with the help of braking systems. Acquire knowledge on the control of the vigilance of the driver of the TSKBM, car driving systems. Guest lectures of top managers are provided within the discipline.	Elements and devices of automation/ Technical means of automation, Basics of automation and track sensors, Devices of technical means of automation	Manufacturing practice 2, Final certification
	PD	EC21	Power supply systems for automation devices	180	6	7	EO9	It is aimed at the formation of students' knowledge about the principles of building power supply devices of railway automation, telemechanics, skills selection of optimal technical solutions for the design and modernization of power supply devices. Acquisition of skills of calculation, diagnostics and regulation of the technical condition of devices. As part of the discipline, field classes are provided in the branch of the department.	Elements and devices of automation/ Technical means of automation, Basics of automation and track sensors, Devices of technical means of automation	Manufacturing practice 2, Final certification
		EC22	Power supply devices of automation and telemechanics				EO9	Formation of skills in the process of studying power supply devices: transformers and transformer substations; semiconductor valves and rectification circuits; chemical sources of electrical energy. The scientific foundations of the organization of operation and power supply of automation and telemechanics devices in transport are being studied. As part of the discipline, field classes are provided to the branch of the department.	Elements and devices of automation/ Technical means of automation, Basics of automation and track sensors, Devices of technical means of automation	Manufacturing practice 2, Final certification



Module 2 – Economic and managerial competencies	EC23	Managerial Economics (Minor 1)	90	3	5	EO11	Formation of the conceptual apparatus and development of economic analysis skills using modern models and laws of economic science, consideration of economic problems and tasks facing the head of the company. The study of this discipline will allow students to gain and develop knowledge in the field of analytical research of economic, technological and technical parameters of an enterprise, and will also allow them to master the skills of applying special methods of economic justification of management decisions and assessing their consequences. Active learning methods are used - situational tasks, case method.	Basics of economics and entrepreneurship, Basics of law and anti-corruption culture	Final certification
	EC24	Time - management (Minor 2)				EO11	Formation of students' general ideas about the essence and types of time management, principles and methods of time resource management for more successful professional activities. Active learning methods are used - situational tasks, case method.	Basics of economics and entrepreneurship, Basics of law and anti-corruption culture	Final certification
Module 4 – IT competencies	EC25	Introduction to MongoDB (Minor 1)	90	3	6	EO10	Formation of students' ability to process large amounts of data (MongoDB) to solve professional problems, effectively apply methods, technologies and tools for analyzing big data in professional activities. Methods of active learning are applied - group work.	Robot control systems/Software testing	Final certification
	EC26	Machine Learning A-Z: Python & R in Data Science (Minor 2)				EO10	Introducing students to the field of Data Science and Machine Learning, which covers data visualization, data analysis, libraries and open source tools. Methods of active learning are applied - group work.	Robot control systems/Software testing	Final certification
	EC27	Controller Programming (Minor 1)	90	3	7	EO10	The study of the basics of creating and applying algorithmic, hardware and software automation systems, management and control of technological processes and productions that ensure the production of high-quality, safe, competitive products, freeing a person fully or partially from production participation in the processes of obtaining, transformation, transmission, use, protection of information and production management. Methods of active learning are used - group work.	Digital electronics/Digital devices and microprocessors	Final certification
	EC28	Simulation modeling in AnyLogic environment (Minor 2)				EO10	Students' acquisition of knowledge on simulation modeling, students' acquisition of knowledge on simulation modeling technologies, types of applied tasks for which simulation modeling is an effective tool; students' acquisition of simulation modeling skills in modern computer modeling systems. Methods of active learning are used - group work.	Digital electronics/Digital devices and microprocessors	Final certification
<b>Total</b>			<b>2130</b>	<b>71</b>					

Head of the «Automation and Control» Department

AGREED:

Chief engineer of Almaty signaling and communication distance (Shch-33)

*[Handwritten signature]*  
30.03.23

K. Sansyzbay



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30.03.23

B. Akhmiev