

APPROVED

Chairman of the Board
NCJSC «S. Seifullin Kazakh
Agro Technical Research University»

Tireuov M.K.

protocol № 78/24» 04 2025 y.



EDUCATIONAL PROGRAM
6B06104 - «DevOps Engineering»

Code and classification of the field of education:

6B06 Information and communication technologies

Code and classification of training areas:

6B061 Information and communication technologies

The code in the International Standard Classification of Education:

0610

Degree/qualification awarded:

Bachelor in Information and Communication Technology the EP 6B06104 - «DevOps Engineering»

Academic Committee:

№	FCs	Academic degree, academic title	Post	Place of work	Signature
1	Shaushenova Anargul Gimranovna	Candidate of Technical Sciences Associate Professor	Head of the Department of Information Systems	Kazakh Agrotechnical Research University named after S.Seifullin	
2	Ismailova Aisulu Abzhapparovna	PhD, Associate Professor (docent)	acting Professor	Kazakh Agrotechnical Research University named after S.Seifullin	
3	Omarkhanova Dinara Zholamanovna	Master	Senior lecturer	Kazakh Agrotechnical Research University named after S.Seifullin	
4	Saluat Kamaridenovich Sagandykov		4th-year student of the educational program 6B06101 "Software Engineering".	Kazakh Agrotechnical Research University named after S.Seifullin	

Agreed with representatives of employers:

№	FCs	Post	Place of work	Signature
1	Kadirkulov Kuanysh	Director	«Smart Soft Kazakhstan» LLP	

The Academic Committee was approved by the order of the Chairman of the Board of NAO "S.Seifullin KATRU"

№ 1.3.1-3/435-к from "17" 12 2025 y.

Educational program 6B06104 - «DevOps Engineering»

Reviewed at:

at the meeting of the Department "Information Systems"

Protocol № 8 from "13" 03 2025 y.,

at the meeting of the Faculty Council on Academic Quality protocol № 9 "19" 03 2025 y.

at the meeting of the Academic Council of the University, protocol № 7 "19" 03 2025 y.

Date of update of the OP «12» 06 2025 y.

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Regulatory references

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

"State mandatory standards of higher and postgraduate education", approved by Order No. 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022;

"Rules for the organization of the educational process on credit technology of education in organizations of higher and postgraduate education", approved by Order No. 152 of the Minister of Education and Science of the Republic of Kazakhstan dated April 20, 2011;

"Standard rules of the organization of higher and postgraduate education", approved by Order No. 595 of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018;

"Qualification requirements for educational activities of organizations providing higher and (or) postgraduate education, and a list of documents confirming compliance with them", approved by Order No. 4 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated January 5, 2024;

Order of the Minister of Education and Science of the Republic of Kazakhstan dated March 20, 2015 No. 137 "On approval of requirements for educational organizations to provide distance learning and rules for organizing the educational process for distance learning and in the form of online training in educational programs of higher and (or) postgraduate education";

Guidelines for the use of the European Credit Transfer and Accumulation System (ECTS);

Standards and guidelines for quality assurance of higher education in the European Higher Education Area (ESG);

Guidelines for the development of educational programs of higher and postgraduate education, Appendix 1 to the order of the Director of the National Center for the Development of Higher Education of the Ministry of Education and Science of the Republic of Kazakhstan dated 05/24/2023 No. 601 n/a;

"Rules for maintaining the register of educational programs implemented by organizations of higher and (or) postgraduate education, as well as the grounds for inclusion in the register of educational programs and exclusion from it", approved by Order No. 106 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated October 12, 2022;

The documented procedure "Documentation Management", approved by the order of the Chairman of the Board-Rector No. 269-N dated 07/24/2023;

The documented procedure "Quality Records Management", approved by the order of the Chairman of the Board-Rector No. 218-N dated 04/21/2020.

Professional standards used in the development of the educational program:

- 1) Software Testing (05.12.2022)
- 2) Database Administration (05.12.2022)
- 3) Software Development (05.12.2022)

Atlas of New Professions:

DevOps Engineer

1 Description of the educational program

1.1 Purpose of education program

EP "DevOps engineering" aims to meet the needs of society in qualified personnel in the field of software development and operation using and applying modern methods and technologies of DevOps.

The profession of DevOps-engineer is included in the Atlas of new professions and competences demanded in the labour market of RK. The proposed educational program project facilitates acquisition of quality professional skills by trainees, which will ensure employment and high wages.

The aim of Educational program «DevOps Engineering» is to train specialists with knowledge of modern technologies in IT industry, capable of synchronizing all stages of software product creation, as well as automation of deployment and maintenance through the use of DevOps-technology.

Objectives of the **DevOps Engineering educational program**:

- Formation of skills to effectively apply DevOps approach in software development and operation, accelerate the process of software release, improve its quality and reliability, as well as ensure data security and protection.
- Training students to work on different platforms with different programming languages, to automate workloads between multiple cloud providers, to provide internal and external support on multiple platforms.
- building theoretical and practical knowledge to learn the basic concepts and methodologies of DevOps, developing and configuring infrastructure using tools and platforms used in DevOps, modern practices and techniques, testing applications using different methodologies.

1.2 Learning outcomes

RO 1. Identify the language tool for problem solving and process information using programming language and application tools, as well as the willingness to work in a team, to use professional documentation in English.

RO 2. Be able to present projects based on scientific research in the field of information technology. Demonstrate entrepreneurial skills while adhering to academic integrity standards, and interpret information in the fields of ICT, ecology, economics, law, Sustainable Development Goals (SDGs), and inclusive approaches to software development.

RO 3. Apply the mathematical apparatus of ICT to construct algorithms for its analysis, transformation and processing and to optimize information processes in various application domains and be able to use the basic laws of science in professional practice.

RO 4. To understand the problems of creating algorithms for problem solving and describing them using programming languages, to orient in different programming environments, to know the control structures of scripting languages and also apply methods of analysis of the applied field at the conceptual, logical, mathematical and algorithmic levels

RO 5. understand agile software development methodologies, demonstrate knowledge of working with databases, present ideas of continuous integration and continuous software delivery and also use modern technical means and information technologies

RO 6. Understand the basics OS, automation of system configuration and deployment, principles of cloud services, choose virtualization and containerization technologies, networking technologies and utilities.

RO 7. Perform the formulation and solution of artificial intelligence tasks, including decision support tasks, use knowledge engineering methods, capabilities of artificial intelligence systems in applications designed for decision support systems.

RO 8. Apply modern, effective methods of IT project management, project manager skills, design and develop an IS in compliance with IT security principles.

RO 9. Apply modern technologies and methods of data collection, methods of their processing and analysis, including the use of intelligent information and analytical systems, in solving management and research tasks.

RO 10. Implement analytical and technological solutions in the field of software (system, applied and instrumental) and computer information processing, as well as possess methods of teaching mathematical and algorithmic modeling of educational tasks of a scientific and technical nature.

2 General characteristics of the educational program (relevance, features, competitive advantages, uniqueness, stakeholders, etc.).

Areas of professional activity in which graduates who have mastered the educational program can carry out professional activities in the design, development, implementation and operation of computer facilities and information systems and their lifecycle management.

The revision of functional and process paradigms in IT product development may require the involvement of professionals in the field of aggregation and process rationalization.

These circumstances determine the relevance of developing and enhancing an educational program

for training generalists (DevOps engineers) at the undergraduate level.

"DevOps engineering" is the subject of professional activity of specialists in implementing and scaling DevOps methodology, synchronizing all stages and elements of software products creation process from code writing phase to testing and release stage.

EP "DevOps Engineering" in the direction of 6B061 Information and Communication Technologies is aimed at meeting the needs of society for qualified personnel in the field of IT-industry, Web-development and software.

The competitive advantages of a DevOps Engineering graduate are:

- Performance verification and refactoring of software code;
- requirements development and design of software and IT project management.

Specificity, uniqueness of implementation of the educational program "DevOps Engineering":

- EP is implemented with the use of dual training and elements of distance learning technologies;
- practical training is implemented using the resources of the Centre of technological competence in the field of digitalization of AIC KATIU named after S. Seifullin, as well as specialized enterprises, with which an agreement on practical training is concluded.
- a set of professional certifications is provided during the training process.

3 Competence model (portrait) of a graduate

3.1 Areas of professional activity

Spheres of professional activity of graduates of OP «DevOps-engineer» on direction 6B061 Information and Communication Technologies:

- the sphere of industrial software production;
- sphere of material production (industry, agriculture, forestry, construction, etc.)
- non-production sphere (health care, education, housing and utilities, trade, etc.)

3.2 Types of professional activity

Types of professional activities of graduates of the program «DevOps-engineer» in the field of 6B061 Information and Communication Technologies:

- Design and development activity in design organizations, IT companies, telecommunication companies as a head of research and development unit, developer and analyst of software and applications, software engineer;
- production-technological activity in industrial enterprises, telecommunications companies, digital devices design and assembly companies, financial organizations as head of production process, head of services and units in the field of information and communication technologies, automated control systems engineer, network security engineer;
- research and experimental-research activities in scientific-research institutions, design and scientific-production organizations as a senior researcher, head of research team, software engineer, electronics engineer;
- organizational and managerial activity in public administration, service, administrative management, business structures as an administrator for information security, head of department for project management, expert analyst, engineer for automated control systems.

3.3 General education competencies

Upon successful completion of this program, the learner will have the following general education competences:

- 1) assesses the surrounding reality on the basis of worldview positions formed by the knowledge of the fundamentals of philosophy, which ensure scientific comprehension and study of the natural and social world by methods of scientific and philosophical cognition;
- 2) interprets the content and specific features of mythological, religious and scientific worldviews;
- 3) argues his/her own assessment of everything happening in the social and industrial spheres;
- 4) expresses civic position on the basis of deep understanding and scientific analysis of main stages, regularities and peculiarity of historical development of Kazakhstan

- 5) uses methods and techniques of historical description to analyze the causes and consequences of events in the history of Kazakhstan
- 6) assesses situations in various spheres of interpersonal, social and professional communication taking into account basic knowledge of sociology, political science, cultural studies and psychology;
- 7) synthesizes knowledge of these sciences as a modern product of integrative processes;
- 8) uses scientific methods and techniques of research of a particular science as well as of the whole socio-political cluster;
- 9) develops own moral and civic position;
- 10) operates with social, business, cultural, legal and ethical norms of Kazakhstani society
- 11) demonstrates personal and professional competitiveness
- 12) applies in practice the knowledge in the field of social and humanitarian
- 13) makes a choice of methodology and analysis
- 14) summarizes the results of the study
- 15) synthesizes new knowledge and presents it in the form of humanitarian socially significant product
- 16) starts oral and written communication in Kazakh, Russian and foreign languages to solve problems of interpersonal, intercultural and industrial (professional) communication
- 17) carries out use of language and speech means on the basis of system of grammatical knowledge; analyzes information according to situation of communication
- 18) assesses the actions and behavior of participants in communication.
- 19) uses different types of information and communication technologies in personal activities: internet resources, cloud and mobile services for search, storage, processing, protection and dissemination of information;
- 20) constructs a personal lifelong learning trajectory for self-development and career advancement, is oriented towards a healthy lifestyle to ensure full social and professional activities through methods and means of physical education;
- 21) know and understand the basic laws of the history of Kazakhstan, basics of philosophical, socio-political, economic and legal knowledge, communication in oral and written forms in Kazakh, Russian and foreign languages
- 22) apply the mastered knowledge for effective socialization and adaptation in changing socio-cultural conditions;
- 23) possesses skills of quantitative and qualitative analysis of social phenomena, processes and problems.

3.4 Core competencies

Upon successful completion of this program, the learner will possess the following core competencies:

- 1) demonstrate knowledge and understanding in the field of study, based on advanced knowledge in the field of study;
- 2) apply knowledge and understanding at a professional level, formulate arguments and solve problems in the field of study;
- 3) collect and interpret information to form judgements taking into account social, ethical and scientific considerations;
- 4) apply theoretical and practical knowledge to solve practical and professional problems in the field of study;
- 5) study skills required to independently pursue further studies in the field of study;
- 6) know the methods of scientific research and academic writing and apply them in the field of study;
- 7) apply knowledge and understanding of facts, phenomena, theories and complex dependencies between them in the field of study;
- 8) understand the meaning of the principles and culture of academic integrity.

3.5 Professional Competencies

Upon successful completion of this program, the learner will possess the following professional

competencies:

Design:

- The ability to develop requirements, technical specifications and design software (conduct business process analysis and identify software requirements; develop technical specifications for software components and their interactions; design software based on developed requirements and technical specifications);

- ability to manage the implementation of DevOps projects.

Production and technological:

- the ability to perform administration of network devices and software of information and communication systems (administers subsystems of the organization's info-communication system; monitors and maintains the organization's info-communication system.);

- The skills of developing, debugging, upgrading and maintaining information systems software (performs software development (upgrades), including the choice of programming technology and tools; carries out software testing, including the development of testing strategy, management of the testing process and analysis of test results; performs work on maintaining the information system and/or its components);

- project virtualization, containerization and orchestration skills with the use of modern tools (deploys a project in a virtual environment; uses containerization in professional practice; applies modern DevOps tools in professional practice);

- the ability to distribute digital data processing (masters the current terminology in the areas of distributed computing, global area networks and cloud computing; designs, develops and administers systems built on cloud technologies; develops the technical documentation necessary for the design and development of systems built on cloud technologies).

Operational:

- Ability to prepare and use systems for their intended purpose, maintenance, storage and transport;

- The ability to handle tasks such as getting the system up and running and maintaining it in an operational state, using it for its intended purpose with the required efficiency, and acting as a support person in various modes of operation.

4 Base of professional internships

Practical training is implemented with the use of resources of the chair «Information Systems», as well as specialized enterprises with which the contract on practical training is concluded.

Educational practice takes place on the basis of the chair «Information Systems» of the Kazakh Agricultural Research University named after S. Seifullin in the first year.

Work practice takes place on the bases of state or private organizations in IT department after the 2nd, 3rd courses and after the first term of the 4th course with the duration of 4-6 weeks.

Pre-diploma practice takes place at the Department of "Information Systems".

№	Name	Telephone	Email	Website
1)	Astana IT, Astana, 31/2 Saryarka Ave.	+7 775 188 8007	info@astana-it.kz	http://astana-it.kz
2)	IT Holding Samgau; Astana, 5B, Imanbayeva str.	+7 717228 1815 +7 777003 3311	Info@samgau.com	http://samgau.com
3)	Oyul Kazakhstan Association of IT-companies, Astana, 6/5 Kabanbay Batyr Ave.	+7 717292 5552		http://itk.kz

4)	JSC National Infocommunication Holding Zerde, Astana, 1 Almaty str.	+7 717257 0778		http://zerde.gov.kz
5)	TransTeleCom JSC,13 Abai Avenue, Astana	+7 717260 0029		http://ttc.kz
6)	Computer Academy "Shag", 23, AliyaMoldagulova str.	+7 717 231 3328 +7 717 291 1458	astana@itstep.org	http://astana.itstep.kz
7)	Net.com" LLP, Astana, 22 Kazhymukan Munaitpasova str.	+7 717 247 8177		http://netcom.kz
8)	Corporate Business Systems, Astana, 3, Kabanbaybatyr Ave.	+7 727 262 2218		http://cbs.kz
9)	InesSoft LLP, 8 MukhtarAuezov Street, Astana	+7 717 272 8510		http://inessoft.kz
10)	Expert-A Training Centre, Astana, 2/1 Bauyrzhan Momyshuly Ave.	+7 771 909 4456 +7 717 262 5266	info@expert-a.kz	http://expert-a.kz
11)	Somnium Astana LLP, 12/2 Kunayev str,	+7 7172 68-98-14;		
12)	AstanaInavation JSC			
13)	JSC Electronic Finance			
14)	National Information Technologies JSC Astana, 8 Orynbor Str., Astana	+7 7172 74-10-70; +7 7172 74-10-81;		
15)	Union of Farms of Kazakhstan Republican Association	87019996661; 87172509928; Ibraev Serik	ibrayev.sn@gmail.com	www.sfk.kz
16)	PLATONUS LLP	87055166919; 87172472525; Айдар Манас	ISPUSINOV@PLATONUS.KZ	PLATONUS.KZ
17)	GlobalServicesInternational, MukhitovAzat	87077555273;	maz@gse.kz	
18)	TerraPoint LLP	87015333406;	Aida_mullash eva@mail.ru	Муллашева Аида финансовый директор

5 Structure of the undergraduate education program

№	The cycle of discipline	The discipline component	Name of cycles and disciplines	Total workload	
				in academic hours	in academic credits
1	2	3	4	5	6
1	GER		General Education Disciplines (GER) cycle	1680	56
1)	GER		Mandatory component	1530	51
	GER	MK	History of Kazakhstan	150	5
	GER	MK	Philosophy	150	5
	GER	MK	Foreign language	300	10
	GER	MK	Kazakh (Russian) language	300	10
	GER	MK	Information and communication technology	150	5
	GER	MK	Cultural studies and psychology	120	4
	GER	MK	Political science and sociology	120	4
	GER	MK	Physical education	240	8
2)	GER		A university component and/or an optional component	150	5
	GER	OK	Economics, Law and Finance in Entrepreneurship	150	5
2	GER		Cycle of core and core disciplines (BD, SD)	At least 5280	At least 176
1)	GER		A university component and/or an optional component	4860	162
	BD	MK	Mathematical analysis	120	4
	BD	MK	Physics	90	3
	BD	OK	Computational methods on a computer	150	5
			Applied statistical analysis		
	BD	MK	Mathematical logic and theory of algorithms	150	5
	BD	MK	Probability theory and mathematical statistics	150	5
	BD	MK	Basics of programming	150	5
	BD	MK	Fundamentals of mathematical and computer modeling	150	5

	BD	MK	Graph theory in computer science	150	5
	BD	MK	Algorithms and data structures for developers	150	5
	BD	MK	Educational practice in programming	30	1
	BD	MK	Fundamentals of object-oriented programming	150	5
	BD	OK	Web programming	150	5
			Python and data analysis		
	SD	MK	Scripting programming languages	150	5
	BD	MK	Databases for DevOps	150	5
			Company database management systems (Oracle)		
	BD	MK	Software development technologies and standards	150	5
	BD	MK	Development and analysis of software requirements	150	5
	BD	OK	Modern database technologies (Oracle)/Database technologies	150	5
	SD	MK	Basics of Software Testing	150	5
	SD	MK	Software development methodologies	120	4
	SD	MK	Introduction to Software Engineering	120	4
	BD	OK	Basics of anti-corruption culture	90	3
			Ecology, life safety principles and SDG		
			Technical English		
	BD	MK	Fundamentals of IT project management	150	5
	SD	MK	Fundamentals of information management	150	5
	SD	MK	Business process modeling	150	5
	BD	OK	Design of software systems and complexes	150	5
			Design and architecture of software systems		
	BD	OK	Big Data Processing Methods and Systems	150	5

			Fundamentals of Big Data Processing Technology		
	BD	OK	Data Mining	150	5
			Visual Programming and Data Mining		
	BD	OK	Basics of Neural Networks	150	5
			Neural networks and their applications		
	BD	OK	Introduction to Machine learning	150	5
			Introduction to Artificial Intelligence		
	BD	OK	Parallel Programming	150	5
			Introduction to parallel programming		
	SD	MK	Fundamentals of Scientific Research in the Field of Information Technology	90	3
	BD	MK	Cybersecurity and data protection	150	5
	SD	MK	Operating systems for DevOps	150	5
	SD	MK	Virtualization and containerization technologies	150	5
	SD	MK	Administration of systems and networks	150	5
2)			Professional practice	420	14
3			Additional training (VET)	-	-
1)			Optional component	-	-
4			Final certification	At least 240	At least 8
			Total	At least 7200	At least 240

The curriculum

The Ministry of Agriculture of the Republic of Kazakhstan NC JSC "S.Seifullin Kazakh Agrotechnical Research University"										APPROVED Member of the Board Vice-Rector for Academic Affairs NC JSC "KATTU" Abisheva R.D. " " 20__ y.																	
Considered at the meeting of Academic Council of the University Protocol № _____ " " 20__ y.																											
WORKING CURRICULUM for 2025-2029 academic year For the modular education program "DevOps Engineering" by the speciality/group of educational programmes B057 – Information technology Degree: Bachelor Form of education: Full-time (bachelor 4 years) semester Entry year: 01-09-2025																											
Module code	Module name	Discipline cycle	Discipline	Code of subject	Subject name	Academic credits	Academic study period	Control in the academic period				Total	Number of hours						Distribution of credits per academic period								
								Exams	Differentiated test	Term paper/report	Classroom work						Independent		Number of weeks in the academic period								
											Lectures		Laboratory	Practicum	Studio lesson	Practice	Independent work of work	Independent work of work	1 course	2 course	3 course	4 course					
																		15	15	15	15	15	15	15	15	15	
General modules																											
1	General education	GE C	IKT 1108		Information and communication technologies	5	1	1			5/150	15	30.0				20	85	5.0								
2		GE C	IYa 1132		Foreign language	5	1	1			5/150			45			5/150	85	5.0								
3		GE C	KRYa 1130		Kazakh (russian) language	5	1	1			5/150			45			20	85	5.0								
4		GE C	FK 1125		Physical education	2	1		1		2/60			30			8	22	2.0								
5		GE C	IYa 1133		Foreign language	5	2	2			5/150			45			20	85		5.0							
6		GE C	KRYa 1131		Kazakh (russian) language	5	2	2			5/150			45			20	85		5.0							
7		GE C	IK 1129		History of Kazakhstan	5	2	2			5/150	15		30			20	85		5.0							
8		GE C	FK 1126		Physical education	2	2		2		2/60			30			8	22		2.0							
9		GE C	FiI 1103		Philosophy	5	3	3			5/150	15		30			20	85			5.0						
10		GE C	FK 2127		Physical education	2	3		3		2/60			30			8	22		2.0							
11		GE C	Pre 2122		Entrepreneurship			3			5/150	15		30			20	85									
12		GE S	OEP 2120		Basics of economics and law			3			5/150	15		30			20	85									
13		GE S	MNI 2121		Methodology of academic research	5	3	3			5/150	15		30			20	85		5.0							
14		GE S	OAK 2123		Basics of anti-corruption culture			3			5/150	15		30			20	85									
15	GE S	EOBZh		Ecology and life safety fundamentals			3			5/150	15		30			20	85										
16	Socio-political	GE C	FK 2128		Physical education	2	4		4		2/60			30			8	22			2.0						
17		GE C	KP 1112		Cultural studies and psychology	4	1	1			4/120	15		30			16	59	4.0								
18	GE C	PS 1109		Political science and sociology	4	2	2			4/120	15		30			16	59		4.0								
Modules of specialty/education program																											
19	Physical and mathematical	BS U	MA 1202		Mathematical analysis	4	1	1			4/120	15		30			16	59	4.0								
20		BS E	Fiz 1258		Physics	3	2	2			3/90	15	15.0			12	48		3.0								
21		BS S	FDI 1275		Physics for computer science	5	2	2			3/90	15	15.0			12	48										
22		BS U	VME 2203		Computational methods on a computer	5	3	3			5/150	15	30.0			20	85			5.0							
23		BS U	MLTA 3234		Mathematical logic and theory of algorithms	5	5	5			5/150	15	30.0			20	85					5.0					
24		BS U	TVMS 3235		Probability theory and mathematical statistics	5	6	6			5/150	15		30			20	85					5.0				
25		BS U	OMKM 4238		Fundamentals of mathematical and computer	5	7	7			5/150	15	30.0			20	85							5.0			
26	Algorithmization and programming	BS U	TGKN 4239		Graph theory in computer science	5	7	7			5/150	15	30.0			20	85							5.0			
27		BS U	ASDOR		Algorithms and data structures for developers	5	1	1			5/150	15	30.0			20	85	5.0									
28		BS U	OP 1237		Basics of programming	5	2	2			5/150	15	30.0			20	85		5.0								
29		BS U	UPPP 1201		Teaching practice Programming	1	2				1/30				30			1.0									
30		BS U	OOOP 2240		Fundamentals of object-oriented programming	5	3		3		5/150	15	30.0			20	85			5.0							
31		BS E	WP 2263		Web development	5	4	4			5/150	15	30.0			20	85					5.0					
32		BS S	RIP 2278		Internet application development			4			5/150	15	30.0			20	85										
33		AS U	SYaP 3335		Scripting programming languages	5	5	5			5/150	15	30.0			20	85					5.0					
34		Software and database development	BS U	OTBD 2245		Basics of database technology	3	3	3			3/90	15	15.0			12	48			3.0						
35			BS U	TSRPO		Software development technologies and	5	4	4			5/150	15	30.0			20	85				5.0					
36	BS U		RATPO		Development and analysis of software	5	5		5		5/150	15	30.0			20	85					5.0					
37	BS E		BDD 3279		Databases for DevOps	5	5	5			5/150	15	30.0			30	75						5.0				
38	BS S		SUBDKO		Company database management systems			5			5/150	15	30.0			20	85										
39	AS U		OTPO 2332		Basics of Software Testing	5	4	4			5/150	15	30.0			20	85					5.0					
40	AS U		MRPO 2304		Software development methodologies	4	4	4			4/120	15	30.0			16	59						4.0				
41	AS U	VPI 2331		Introduction to software engineering	4	4	4			4/120	15	30.0			16	59						4.0					

Appendix 1 to the Academic calendar

Appendix 1 to the Academic Calendar
Approved by the Academic Council of the NJSC "S.Seifullin KATHUS", Protocol No4, of 24.10.2024 y.

Schedule of the educational process for the 2024-2025 academic year for the educational programs faculty of Computer Systems and Vocational Training

BACHELOR

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Conventions

PW presentation week
• theoretical training
TD curriculum disciplines
E examination session

S summer semester
FE final examination
EP educational practice
IP industrial practice

Активация Windows

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The relationship between the attainability of the intended learning outcomes of the educational program and academic disciplines

Matrix of the influence of disciplines on the formation of learning outcomes:

№	Name of discipline	Brief description of the discipline	N u m b e r o f l o a n s o f c r e d i t s	Formative learning outcomes									
				L O 1	L O 2	L O 3	L O 4	L O 5	L O 6	L O 7	LO 8	L O 9	L O 10
	General Education Cycle Higher Education Component/Optional Component												
1.	Economics, Law and Finance in Entrepreneurship	The discipline is aimed at developing a systematic understanding of the key aspects of entrepreneurship, taking into account economic, legal and financial factors. The course covers modern approaches to business organization and management, legal foundations of entrepreneurship, as well as financial instruments necessary for sustainable development of enterprises.	5		v								
	Cycle of core disciplines Higher education component												
2.	Algorithms and data structures for developers	The course discusses the main approaches to the analysis and design of algorithms and data structures. Asymptotic estimation of algorithm complexity, efficient sorting algorithms and selection of ordinal statistics, data structures, methods of algorithm design, basic algorithms on graphs	5				v						
3.	Cybersecurity and data protection	Information security standards. International standards for information exchange. The concept of threats, attacks. Global networks and information security. The concept of an information security perpetrator. Hackers. Types of hackers. Examples of hacker attacks. Viruses as a class of malicious software. Types of viruses and their classification. Protecting the information system from threats. Purpose and tasks in the field of information security at the state level.	5			v							
4.	Mathematical logic and algorithm theory	The basic concepts and methods of mathematical logic and the theory of algorithms, with a focus on their use in practical computer science, including artificial intelligence systems and computer technology; the formation of systematized knowledge in the field of mathematical logic, the development of logical thinking, logical culture.	5			v							
5.	Mathematical analysis	The aim of the course is to introduce students to the important branches of calculus and its applications in IT.	4			v							

		During the educational process, students should learn and be able to apply mathematical methods and tools to solve various applied problems. Moreover, they study fundamental methods of studying infinitesimal variables by means of analysis, which is based on the theory of differential and integral calculations.											
6.	Fundamentals of mathematical and computer modeling	Introduction Computer modelling. The concept of modelling, models. Types of modelling, types of models. Classification of models. Creating computer models of simple mechanical processes.	5				v						
7.	Fundamentals of object-oriented programming	The main elements of the object model. Relationships between objects and classes. Basic principles of object-oriented programming. About the features of the .NET platform. Classes in C#. Basic concepts. Functional types in C#. Inheritance and late binding polymorphism. Virtual functions and abstract classes. Generalizations. Basic concepts	7				v						
8.	Fundamentals of IT project management	Project initiation. Project planning. Development of the project timetable. Planning for project quality assurance. Planning project risks. Planning project human resources. Planning for communication and configuration management on a project. Assessing the feasibility of the project. Identifying the risks of the project. Project management during the design phase. Implementation of the communication plan and user training. Project management in the development and implementation phase.	5								v		
9.	Basics of database technology	Purpose and basic principles of architecture of database management systems. Theoretical foundations of relational databases. Using the SQL language in application programs. The concept of an active database. Stored procedures and triggers. Basic principles of database structure design. Fundamentals of transactional processing in database management systems. Security of database management systems. Elements of Data Warehousing technology	3				v						
10.	Basics of programming	This discipline outlines the basics of algorithm development and program implementation using object-oriented tools. Examples are demonstrated by means of the C++ language	5				v						
11.	Probability theory and mathematical statistics	Random event. Probability, random variable (Basic concepts of probability theory. Types of random events. Classical definition of probability. Basic formulas of combinatorics. Relative frequency. Relative frequency stability). Distribution laws, the law of	5				v						

		large numbers. Two-dimensional random variables, mathematical statistics (Problems of mathematical statistics. General and sample population. Polygon and histogram. Empirical distribution function. Statistical evaluation of distribution parameters).											
12.	Graph theory in computer science	Fundamental concepts and mathematical apparatus of graph theory. The main problems of graph theory and methods of their solution. The effective use of graph models for solving applied problems, the use of software interface development tools for the implementation of graph algorithms.	5			v							
13.	Development and analysis of software requirements	Documented, feasible, testable requirements, with a level of detail sufficient for system design. Functional and non-functional requirements. Types of programmer activities in requirements analysis. Methodology for development of design working technical documentation. Management of content, time, cost and quality, human resources, risks in software development.	5				v						
14.	Physics	The discipline studies basic physical phenomena, fundamental laws and concepts, as well as methods of physical research. He examines techniques and methods for solving typical problems from various fields of physics, introduces modern scientific equipment, develops experimental skills, and the ability to identify specific physical content in the applied tasks of a future specialty .	3			v							
15.	Software development technologies and standards	The main stages in the development of software development technology. Evolution of software life cycle models. Standards governing the software development process. Requirements development and external software engineering. Structural approach to software design. Design and programming of modules. Design and development of software interface. Testing, debugging and building software. Maintenance of software at the stage of operation. Software development management. Development and standardization of information technologies	5					v					
Core Discipline Cycle Elective Component													

		neural networks.												
26.	Neural networks and their applications	Artificial neural networks. Architecture of artificial neural networks. A set of tools for creating, initializing, training, modeling and visualizing a network. Methods and algorithms for training artificial neural networks. Gradient learning algorithms. Algorithms based on the use of the conjugate gradient method. Application of neural networks for designing control systems for dynamic processes.							v					
27.	Fundamentals of big data processing technology	Introduction to Big Data. Technologies for collecting and storing big data. Big data processing and analysis technologies in modern IT infrastructure: The lifecycle of Big Data analysis, standards.	5										v	
28.	Methods and systems of big data processing	Introduction, distributed file systems. The MapReduce calculation model. SQL over BigData. Hive. Beyond MapReduce. Spark. Machine learning on big data. Streaming data processing. Key-value of storage in big data.											v	
29.	Web development	Features of IP protocols versions 4 and 6. IP tunnels. Designing a site. Principles of construction of hypertext information systems. Client web technologies: HTML, CSS, JavaScript, HTML5, Ajax, JQuery, XML; JavaScript scripting language, jQuery. Programming in PHP, PHP7. Framework Yii, Laravel. SQL query language. Create MySQL database. PostgreSQL DBMS.	5	v		v								
30.	Python and data analysis	The discipline is aimed at studying general scientific terminology and terminology for the language of the relevant specialty in English, forms skills in the types of communicative activities: reading with a full understanding of authentic texts in the specialty, the ability to write an essay on the problem of the field of study.		+			+					+		

31.	Design of software systems and complexes	The industry of industrial development of software systems. Architecture of software systems. Architectural structures and representations. Modular structures. Distribution structures. Variants of software system architectures. The life cycle of software systems. PS design strategies. Design of software systems. Setting requirements for the PS. Development of technical specifications for the design of software systems. Requirements analysis and development of external specifications. Structural design.	5								v		v
32.	Design and architecture of software systems	A complex of parallel running programs. Layered architecture. Means of program interaction. Methods and means of information security software systems. Standards and profiles in the field of software systems. Methodological foundations of software systems design. Requirements analysis. Ascending and descending methods of software development. Interface design. Software models with structural and object-oriented approach. Documenting software systems. Computer-aided design and documentation of software products.									v		v
33.	Parallel programming	Basic information about parallel computers. Performance Analysis. First steps towards parallel programming. Scalable algorithmic methods. Stream programming. MPI standard and other local level languages. ZPL language and other global languages. Perspective directions in parallel programming	5				v						v
34.	Introduction to parallel programming	The discipline studies basic information about parallel computers. Performance analysis. The first steps in the direction of parallel programming. Scalable algorithmic methods. Streaming programming. MPI standard and other local-level languages. The ZPL language and other global-level languages. Assessment of the current state of the issue.				v							v
35.	Databases for DevOps	Databases and database management systems. Functional composition. Classification of database architectures. System directories. Data models. Multi-user services. NoSQL class database management systems. The difference is SQL vs. NoSQL. The NoSQL model. Types of systems. Storage and access to complex data structures	5					v					

36.	Company database management systems (Oracle)	Relational data model. Basic operations of relational algebra: selection, projection, Cartesian product. Data models. Technology and principles of database design. Modeling of the subject area. Principles of organization of Oracle DBMS. Organization of external memory. The level of direct data management in external memory. Database design in Oracle DBMS. The main components of the Oracle database. Client-server data organization models						v						
Cycle of major disciplines Higher education component														
37.	Systems and network administration	Techniques for managing network devices, network protocols, network operating systems, directory services, network services. Management of system file resources, resource access rights, printing devices, information backup and recovery systems, monitoring of network devices and services. Fundamentals of logical design, configuration and maintenance of computer networks.	5						v					
38.	Introduction to Software Engineering	The concept of a software product. The difference between a software product and a programme. Development of programming technology. Requirements for modern programming technology. The concept of software engineering. The concept of software product life cycle. Basic approaches to software development. Monumental and lightweight technologies. Basic concepts of the initial stages of a software project. Approaches to organizing a team of programmers. Basic MSF principles. Team organization. Organizing the software development process.	4			v	v							
39.	Software development methodologies	The complexity of software. The life cycle of software. Identifying the requirements for a software system. Review of software product design methodologies. Rapid software development techniques. Object-oriented design of a software system. Tools for information support for software projects and products (CALS) technology. Testing and debugging of software systems. Evaluation of software quality. Implementation and maintenance of software products.	4					v						
40.	Business process modelling	Fundamentals of business process modelling. Systemic understanding of business modelling technology, understanding the essence of business modelling based on the use of modern information technologies. Fundamentals of process approach in organization management, construction and analysis of business process models. Basic methodologies for	5											v

		modeling, analysis and improvement of business processes. Modern tools for modelling and analysis of business processes											
41.	Operating systems for DevOps	The concept of OS. Hardware and software. The concept of OS. Hardware and software. Core of OS. Interrupt circuitry. Process control. Memory management. Concept of virtual memory. File system. Filesystem facilities. File system topology. I/O management system. Structural hardware and software features. Organizing local computer networks. The main hardware and software components. The topology of a LAN. The UNIX operating system. Its main features. Interprocess communication. Process control. System calls and APIs. Examples of UNIX implementations. SOLARIS, UNIX HP, FREE BSD, LINUX.	5						v				
42.	Fundamentals of information management	Principles, concepts and modern methods in the field of information resources management at all stages of the life cycle of information systems. Fundamentals of IS management in the process of creation, implementation and operation based on quality assessment of information products and services offered in the information market. Methods of using modern information management systems.	5								v		v
43.	Fundamentals of Scientific Research in the Field of Information Technology	The study of various techniques and methods of scientific research: analysis, synthesis and design in General. Determination of the purpose, objectives and factors affecting the design. Ability to apply research results in design. Work with sources. Analysis of analogues. Preparation of the concept.	3		v								
44.	Basics of Software Testing	Basic concepts of testing. Criteria for selecting tests. Evaluation of the project's testing: metrics and methods of integral evaluation. Modular and integration testing. Types of testing. Features of industrial testing. Documentation and evaluation of industrial testing. Regression testing methods. Algorithm and software system for regression testing support.	5										v

45.	Scripting programming languages	Programming paradigms. Scripting programming languages. Basic basic constructions of script programming languages. Ruby programming language. Basics of metaprogramming. PERL programming language. Basics of OOP and web programming in PERL. Purpose and application of CSS. Syntax of CSS. JavaScript language. Basic constructs. Events.	5				v						
46.	Virtualisation and containerisation technologies	Definition of virtualisation and levels of implementation. Software and hardware virtualisation. Types and basic hypervisors. Paravirtualisation. Server virtualization. Virtualization platforms. The basics of modern containerization. Docker. Kubernetes. Virtualisation and containerisation management systems.	5					v					