

Ministry of Agriculture of the Republic of Kazakhstan
S.Seifullin Kazakh Agro Technical Research University

APPROVED

Chairman of the Board – Rector
JSC «International University of
Information Technologies»

Issakhov A.A.
protocol № ____ " ____ " ____ 2025 y.

APPROVED

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



Tireuov M.K.
protocol № ____ " ____ " ____ 2025 y.

EDUCATIONAL PROGRAM
6B06115 -«Digital agricultural systems and complexes»

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 6B06115 -«Digital agricultural systems and complexes»

Degree/qualification awarded:

Bachelor in Information and Communication Technology the EP 6B06115 -«Digital agricultural systems and complexes»

Astana 2025

Academic Committee of NAO "S.Seifullin KATRU":

№	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	Beldeubayeva Zhanar Toleubaevna	PhD	Senior lecturer	Kazakh Agrotechnical Research University named after S.Seifullin	
4	Salauat Kamaridenovich Sagandykov		4th-year student of the educational program 6B06101 "Software Engineering".	Kazakh Agrotechnical Research University named after S.Seifullin	

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

№ ¹⁸¹~~3/435~~ from "17" 12 2023 y.

Academic Committee of the International University of Information Technologies (IUIT):

№	FCs	Post	Place of work	Signature
1	Uskenbayeva R.K.	Rector	JSC "IUIT "	
2	Umarov T.F.	First Vice-Rector	JSC "IUIT "	
3	Rysbayuly B.	Professor of the Department of "Mathematical and Computer Modeling"	JSC "IUIT "	
4	Ydyris A.Zh.	Head of the Department of "Mathematical and Computer Modeling"	JSC "IUIT "	
5	Bakhtiyarova E.A.	Head of the Department "Radio Engineering, Electronics and Telecommunications"	JSC "IUIT "	

Agreed with representatives of employers:

№	FCs	Post	Place of work
1	Serikbaiuly Meiirzhan	Vice director	«AVR Group KZ» LLP



Educational Program 6B06115 – "Digital Agro-Systems and Complexes"

Reviewed at:

Meeting of the Department *"Information System"*
Protocol № 8 " 13 " 03 2025 y.,

Meeting of the Department of the International University of Information Technologies (IUIT)
Protocol № _____ " ____ " _____ 2025 y.,

Meeting of the Faculty Council on Academic Quality
Protocol № 4 from " 19 " 03 2025 y.,

Meeting of the Faculty Council of the International University of Information Technologies (IUIT)
Protocol № _____ from " ____ " _____ 2025 y.,

Meeting of the Academic Council of the University
Protocol № 7 from " 19 " 03 2025 y.,

Meeting of the Collegial Body of the Partner International University of Information Technologies (IUIT)
Protocol № _____ from " ____ " _____ 2025 y.,

Date of update of the OP «17» 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:

IoT specialist

1 Description of the educational program

1.1 Purpose of education program

A specialist in the digitalization of agriculture using software language tools in solving production tasks and performing data analysis that identifies trends. And also this educational program will allow you to develop mobile applications for the needs of the agricultural sector.

A specialist in the digitalization of agriculture provides consulting services for consumers in the application of OT-infrastructure components in the agricultural sector of the economy, to modernize agricultural systems and complexes.

Training of highly motivated IT personnel with knowledge and skills in the field of creation and maintenance of information and control systems focused on application in digital agricultural systems and complexes for digitalization of agriculture. The ultimate goal is to train a specialist in the field of digitalization of agriculture, to increase the efficiency of the industry and provide additional opportunities to consumers through the use of ICT technologies for processing, storing, exchanging and managing information.

The objectives of the educational program «Digital agricultural systems and complexes» are:

- Software development using modern information technologies for agricultural equipment and machinery designed for the production, processing and storage of livestock and crop products.
- Setup, control of work, use of modern equipment and software tools involved in the agricultural enterprise.
- Design of automatic and technological processes of production, processing and storage of crop and livestock products.
- Selection of modern solutions to increase the productivity of the enterprise, based on the specifics of its work and financial capabilities.
- Participation in the testing of software systems, automation tools, technological equipment, agricultural machinery.
- Calculation of the cost of project implementation, costs of operation and maintenance of equipment, material and labor resources, possible losses from defects and downtime.
- Formation of competencies in various fields of programming and modern applied mathematics and computer science.
- Obtaining skills of professional work in solving applied and analytical problems in the field of digitalization of agriculture with the use of modern tools and tools of information technology.
- Development of technological and infrastructural requirements for the management system of agricultural systems and complexes, processes and technologies.
- Learning to work in an English-speaking environment, adaptation to the international education system.

1.2 Learning outcomes

LO 1. Demonstrate knowledge in the field of physical training, know the current legislation in the field of anti-corruption, the basic laws and principles of philosophy, cultural studies and socio-political disciplines

LO 2. Be able to explain the principles of functioning of agricultural systems; use knowledge in the field of agriculture in professional activities.

LO 3. Be able to work in any operating system and with databases; apply methods and means of information protection; work with spreadsheets, consolidate data, build diagrams.

LO 4. Perform calculations of agricultural machinery designs, including using software products, as well as understand the processes of automation of processing, storage and transportation of agricultural products.

LO 5. Be able to find the necessary experimental and technological foundations on which the necessary properties of agricultural models can be recreated more efficiently and accurately.

LO 6. Be able to implement the necessary experimental and technological foundations to achieve higher profitability of the agro-industrial complex and animal husbandry.

LO 7. To develop design work in the agricultural sector with the use of IT technologies, design of engineering systems, mechanical and electrical equipment and means of mechanization using modern innovative developments in the field of energy conservation.

LO 8. To argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, as well as to perceive professional information in English for conducting and publishing scientific research.

LO 9. Describe the basic concepts of linear algebra and analytical geometry; the basic fundamental concepts of mathematical analysis; theory of limits; theory of continuous functions of one variable; differential calculus of functions of one real variable.

LO 10. To carry out installation, configuration, testing, maintenance of system and application software of computer systems and networks, as well as the ability to apply machine learning and statistical modeling methods to select functions and classify the received data.

LO 11. Use programming language tools in solving agricultural problems and interpret the results of a comprehensive analysis of agricultural processes, identify trends, and make a forecast.

LO 12. Create mathematical models using the methods of modern information technologies and apply mathematical models and methods of various processes, as well as competent in the operation of engineering systems.

LO 13. Develop and / or use software, hardware, information, mathematical, functional support of information systems, including algorithms and methods of information security, design database architectures, software.

LO 14. To know about the principles and laws of the historical development of society, the historical periodization of the history of Kazakhstan, as well as to be competent in management, economics, law and environmental protection, in methods and methods of scientific research, socio-economic relations, to have entrepreneurship skills.

LO 15. Be able to apply the main legislative, regulatory, reference documents and bases of the state system of standardization and certification, metrology, as well as to make calculations, design of agricultural buildings and structures, farms and greenhouses, heat supply systems, ventilation, water supply, sewerage, organization of agricultural production.

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

Implementation of tasks within the framework of applied computer programs to optimize the placement of crops in zonal crop rotation systems; calculation of fertilizer doses; selection of high-yielding plant varieties; breeding of highly productive animal breeds, creation of biologically active feed additives, new medicines for animals, etc. The use of geoinformation technologies for land management and land management; maintaining the state land cadastre of the history of fields and the development of technological maps for the cultivation of agricultural crops.

But, the need for competent specialists in this field far exceeds the capabilities of universities to prepare these specialties.

At the same time, the qualification requirements imposed by employers in most cases are much more than the competencies that a student receives within the walls of a university.

These circumstances determine the relevance of the development and improvement of the educational program for training programmers of a wide profile at the bachelor's level.

«Digital agricultural systems and complexes» is the subject of professional activity of specialists in the development, maintenance of application software and management of ICT projects in agricultural sectors.

EP «Digital agricultural systems and complexes» in the direction 6B061 Information and communication technologies, is aimed at meeting the needs of the agricultural sector in qualified personnel in the field of information technology and computer technology, capable of solving complex engineering tasks.

The competitive advantages of the graduate of the EP «Digital agricultural systems and complexes» are:

Implementation of tasks within the framework of applied computer programs to optimize the placement of crops in zonal crop rotation systems; calculation of fertilizer doses; selection of high-yielding plant varieties; breeding of highly productive animal breeds, creation of biologically active feed additives, new medicines for animals, etc. The use of geoinformation technologies for land management and land management; maintaining the state land cadastre of the history of fields and the development of technological maps for the cultivation of agricultural crops.

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EP «Digital agricultural systems and complexes» in the direction 6B061 Information and communication technologies, is aimed at meeting the needs of the agricultural sector in qualified personnel in the field of information technology and computer technology, capable of solving complex engineering tasks.

The competitive advantages of a graduate of the EP «Digital Agricultural Systems and Complexes» are:

- to argue for the choice of basic standards, principles and design patterns, methods and tools and programming languages;
- to show sociability, initiative and psychological readiness for work, including when working in a team and to make managerial and technical decisions;
- design and develop comprehensive software for the agricultural sector of the economy;
- knowledge of modern methods of automation of engineering and graphic works, basic techniques of work when using modern graphic programs;
- knowledge of the composition and completeness of design and technological documentation;
- knowledge of the rules for the design of technological processes for the production of blanks, route and operational maps;
- knowledge of the structure of algorithms for computer-aided design of technological processes;
- knowledge of information technologies for designing machines, assembly units and technological processes;
- knowledge of the basics of performing flat drawings and SD models of simple parts and assembly units in graphic packages;
- the ability to carry out the mathematical formulation of applied problems and implement it in the form of algorithms and programs in an algorithmic language, as well as the use of methods for solving them;

- knowledge of methods of mathematical modeling in the professional field, methods of decision-making;
- ability to work with professional databases and information resources for various purposes;
- to understand the trends and prospects for the development of digital technologies;
- understand the opportunities and risks of implementing digital technologies.

The proposed project of the educational program promotes the acquisition by students of a greater number of trending professional skills, thus, it allows them to provide employment and high wages.

Stakeholders are:

- companies providing agricultural consulting services;
- companies designing and selling agricultural machinery;
- companies developing software for modern technical devices;
- large agricultural complexes;
- farms, etc.

3 Competence model (portrait) of a graduate

3.1 Areas of professional activity

Areas of professional activity of graduates of the EP «Digital agricultural systems and complexes» in the direction 6B061 Information and communication technologies»:

- the sphere of agro-industrial and livestock complex (geo-positioning, precision farming, etc.);
- the sphere of material production ("smart farms"; "smart greenhouses"; raw materials management, storage and transportation of agricultural products; management agricultural transport);
- the sphere of data processing ("big data", graphical constructions, optimization calculations).

3.2 Types of professional activity

Types of professional activity of graduates of the EP «Digital agricultural systems and complexes» in the direction 6B061 Information and communication technologies:

- the market of agricultural consulting services providing intellectual services to agricultural enterprises;
- development, testing, maintenance of software for agricultural robots, equipment, sensors or agrobots;
- automation of a set of ecosystems of one natural and climatic zone, a single natural complex characterized by some basic type of vegetation or other feature of the landscape (biome);
- the use of new methods of managing the production process using GIS, GPS and a new generation of computers (precision farming).
- highly automated types of agro-industrial complex located in a specially designed high-rise building (vertical farm).
- research and experimental research activities in research institutions, design and scientific organizations of agricultural direction as a researcher, software developer;
- organizational and managerial activities in public administration bodies, in the service sector, administrative management, in business structures as the head of the project management department, an expert analyst, an engineer for automated management systems.

3.3 General education competencies

After successful completion of this program, the student will possess the following general education competencies:

- 1) assesses the surrounding reality on the basis of worldview positions formed by knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical cognition;
- 2) interprets the content and specific features of the mythological, religious and scientific worldview;
- 3) argues his own assessment of everything that is happening in the social and industrial spheres;
- 4) shows a civic position based on a deep understanding and scientific analysis of the main stages, patterns and peculiarities of the 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 specific science, as well as the entire socio-political cluster;
- 9) develops his own moral and civic position, as well as independently comprehensively and critically analyze historical and modern sources, draw conclusions and argue them;
- 10) operates with social, business, cultural, legal and ethical norms of the Kazakh society;
- 11) demonstrates personal and professional competitiveness;
- 12) applies in practice knowledge in the field of social sciences and humanities;
- 13) selects methodology and analysis;
- 14) summarizes the results of the study;
- 15) synthesizes new knowledge and presents it in the form of humanitarian socially significant products;
- 16) enters into communication in oral and written forms in Kazakh, Russian and foreign languages to solve the problems of interpersonal, intercultural and industrial (professional) communication;
- 17) carries out the use of language and speech means based on the system of grammatical knowledge; analyze information in accordance with the communication situation;
- 18) assesses the actions and actions of the communication participants.
- 19) uses various types of information and communication technologies in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information;
- 20) builds a personal educational trajectory throughout life for self-development and career growth, focus on a healthy lifestyle to ensure full-fledged social and professional activities through methods and means of physical culture;
- 21) have basic knowledge and communication skills in the areas related to the educational program "Digital agricultural systems and complexes" in Kazakh, Russian and English in practical and research activities;
- 22) applies the acquired knowledge for effective socialization and adaptation in changing socio-cultural conditions;
- 23) has the skills of quantitative and qualitative analysis of social phenomena, processes and problems.

3.4 Core competencies

After successful completion of this program, the student will have the following basic competencies:

- 1) have the skills to use algorithms and programs to calculate the parameters of technological processes;

2) know the main directions of ICT development, the basics of using information resources for searching and storing information, the architecture and components of computer systems, the main goals and objectives of information security, the use of search engines and electronic resources for professional purposes;

3) the ability to apply methods of solving differential and integral calculus of functions of several variables in applied problems, to be able to apply methods of solving differential equations in solving applied problems, to determine the optimal methods for solving practical problems;

4) know the methodological, regulatory and guidance materials related to the work performed, the main characteristics of natural and man-made environments;

5) be able to develop methodological, regulatory materials, technical documentation, as well as proposals and measures for the implementation of developed projects and programs;

6) have an idea of the Python high-level programming language for further work with data;

7) have an idea of scripting languages and methods of writing program codes for them;

8) have an understanding of trends in data mining technologies, standards and tools;

9) know the main problems that arise in data analysis and ways to solve them, types and methods of organizing data warehouses, classification of analytical systems.

10) learning skills necessary for independent continuation of further education in the field of study;

11) know the methods of scientific research and academic writing and apply them in the field under study, as well as possess modern technologies for information support of scientific research;

12) apply knowledge and understanding of facts, phenomena, theories and complex dependencies between them in the field under study;

13) understand the importance of the principles and culture of academic integrity.

3.5 Professional Competencies

After successful completion of this program, the student will possess the following professional competencies:

1) master high-level programming languages, database creation and support, data analysis. Have the skills to develop new algorithms to solve problems in data analysis.

2) the ability to develop and use graphical technical documentation;

3) understand the theoretical basis of electrical engineering, electronics and microprocessor technology;

4) the ability to organize agribusiness in the conditions of digitalization of the economy and conduct information and marketing business;

5) knowledge of the device and understanding of the principle of operation of modern agricultural machinery;

6) be competent in the knowledge of modern methods of construction and use of geoinformation systems;

7) possess knowledge in the field of design, modeling, construction and operation of unmanned aerial vehicles (UAVs) and autopilot;

8) the ability to use modern information processing technologies, to search, store, process and analyze information from various sources and databases;

9) be able to create and develop comprehensive software for digital agricultural systems and complexes;

10) the ability to use information technology and software modeling tools in agriculture;

11) the ability to use control systems, navigation and automatic regulation of technological parameters of processes in agriculture and service organization;

12) knowledge of the basic methods of organizing the protection of production personnel and the population from the possible consequences of accidents, catastrophes, natural disasters;

- 13) ability to process large amounts of information;
- 14) readiness to assess the level of security of digital systems of agriculture and animal husbandry, to organize the protection of information;
- 15) readiness to use technical means of automation and control systems, automation of technological processes and digitalization systems;
- 16) the ability to assess the current state of development of agricultural digitalization systems.

4 Base of professional internships

Educational practice, lasting 2 weeks, takes place on the basis of the Department of "Information Systems" of the Kazakh Agrotechnical University named after S.Seifullin in the first year.

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,	+7 771 909 4456		http://expert-a.kz

	2/1 Bauyrzhan Momyshuly Ave.	+7 717 262 5266	info@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	ISPUSINO V@PLATONUS.KZ	PLATONUS.KZ
17)	GlobalServicesInternational, MukhitovAzat	87077555273;	maz@gse.kz	
18)	TerraPoint LLP	87015333406;	Aida_mullasheva@mail.ru	Муллашева Аида финансовый директор
19)	AVR Group KZ LLP, Astana, Kuishi Dina Street 14	87085446945	augmented.vr@gmail.com	www.avr-group.net
20)	Expert agricultural company, Astana, 38/4 Zheltoksan str.	+7 (7172) 571592		18493-kz.all.biz
21)	Technosila LLP-Kazakhstan, Astana, Republic Ave., 62	+7 (7172) 323594		20088.kz.all.biz

5 Structure of the undergraduate education program

№	Discipline cycle	Discipline component	Name of cycles and disciplines	Total workload	
				in academic hours	in academic credits
1	2	3	4	5	6
1	GER			1680	56
1)	GER		Mandatory component	1530	51
	GER	CS	History of Kazakhstan	150	5
	GER	CS	Philosophy	150	5
	GER	CS	Foreign language	300	10
	GER	CS	Kazakh (russian) language	300	10
	GER	CS	Information and communication technologies	150	5
	GER	CS	Cultural studies and psychology	120	4
	GER	CS	Political science and sociology	120	4
	GER	CS	Physical education.	240	8
2)	GER		A university component and/or an optional component	150	5
	GER	ES	Economics, Law and Finance in Entrepreneurship	150	5
2			Cycle of core and core disciplines (BS, AS)	не менее 5280	не менее 176
1)	BS	UC	Electronics and circuit engineering	150	5
	BS	ES	Professionally oriented English/ Basics of anti-corruption culture/ Ecology, life safety principles and SDG	90	3
	BS	UC	Digital devices and microprocessors	150	5
	BS	ES	Administration of cloud systems/ Network administration	120	4
	BS	ES	Modern agricultural machinery/ Precision agriculture basics/ Python and data analysis	150	5

	BS	ES	Metrology, standardization and quality assurance in crop production and agriculture/ Metrology, standardization and quality assurance in animal husbandry	150	5
	BS	ES	Fundamentals of animal husbandry/ Fundamentals of agronomy	150	5
	BS	ES	Botany/ Animal Morphology/ Applied statistical analysis	150	5
	BS	ES	Selection and seed production of agricultural crops/ Breeding and selection of agricultural animals	150	5
	BS	ES	Modeling systems in agriculture/ Fundamentals of computer modeling in agriculture	90	3
	BS	UC	Automatic control theory	150	5
	BS	UC	Algebra and geometry	150	5
	BS	UC	Mathematical analysis	150	5
	BS	UC	Physics	120	4
	BS	UC	Probability Theory and Mathematical Statistics	120	4
	BS	UC	Discrete Mathematics and Mathematical Logic	120	4
	BS	UC	Introduction to programming	180	6
	BS	UC	Educational practice	60	2
	BS	UC	Algorithms and data structures	150	5
	BS	UC	Python programming	180	6
	BS	UC	Object-oriented programming	180	6
	BS	ES	Machine-oriented programming/ Machine	150	5

			Learning		
	AS	ES	Database theory/ Database management systems	120	4
	AS	ES	Web technologies/ Design and development of Internet applications	150	5
	BS	ES	Animal Physiology/ Plants physiology	150	5
	BS	ES	Innovative technologies in livestock/ Information technology in crop production	150	5
	AS	ES	Automation of technological processes in crop production agriculture/ Automation of technological processes in animal husbandry	150	5
	AS	ES	Automation of traceability of crop production/ Automation of traceability of livestock products	120	4
	AS	ES	Production technology of animal husbandry products/ Production technology of plant growing products	150	5
	AS	CS	Internship	120	4
	AS	CS	Internship	120	4
	AS	CS	Pre diploma practice	270	9
	AS	ES	Unmanned vehicles and autopilots / Geoinformation technologies in agriculture	90	3
	AS	ES	Logistics in the agro- industrial complex/ Intelligent logistics systems of livestock enterprises	150	5

	AS	ES	Intelligent logistics systems in the agro-industrial complex/ Digitalization of agricultural services	120	4
	AS	ES	Fundamentals of Scientific Research in the Field of Information Technology	90	3
	AS	UC	Embedded systems and the Internet of Things in the agro-industrial complex	150	5
	AS	ES	Fundamentals of mechanotronics and robotics/ Theory of electric chains	120	4
2)			Professional practice	420	14
3			Additional training (VET)	-	-
1)			Optional component	-	-
4			Final certification	Не менее 240	Не менее 8
			Total	Не менее 7200	Не менее 240

The curriculum

WORKING CURRICULUM for 2025-2029 academic year For the modular education program “Digital agricultural systems and complexes” 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				Number of hours							Distribution of credits per academic period									
								Exams	Differentiated test	Term paper/pr object	Total	Classroom work					Independent		1 course		2 course		3 course		4 course			
												Lectures	Laboratory training	Practice	Studio lessons	Practice	Independent work of student	Independent work of student	1	2	3	4	5	6	7	8		
																											Number of weeks in the academic period	
																			15	15	15	15	15	15	15	15		
1	Language	GER	CS	KRYa 1104	Kazakh (russian) language	5	1	1			5/150			45			20	85	5.0									
2		GER	CS	IYa 1101	Foreign language	5	1	1			5/150			45			20	85	5.0									
3		GER	CS	IYa 1107	Foreign language	5	2	2			5/150			45			20	85		5.0								
4		GER	CS	KRYa 1106	Kazakh (russian) language	5	2	2			5/150			45			20	85		5.0								
5		BS	ES	POIYa 3221	Professionally oriented English	3	5	5			3/90			30			12	48					3.0					
6		BS	ES	AYaDSC 3260	English for special purposes	3	5	5			3/90			30			12	48					3.0					
7	Historical, social and economic bases	GER	CS	KP 1111	Cultural studies and psychology	4	1	1			4/120	15		30			16	59	4.0									
8		GER	CS	PS 1103	Political science and sociology	4	1	1			4/120	15		30			16	59	4.0									
9		GER	CS	IK 1119	History of Kazakhstan	5	2	2			5/150	15		30			20	85		5.0								
10		GER	CS	Fil 2114	Philosophy	5	3	3			5/150	15		30			20	85			5.0							
11	General education module	GER	CS	IKT 1102	Information and communication technologies	5	1	1			5/150	15	30.0				20	85	5.0			5.0						
12		GER	CS	FK 1105	Physical education.	2	1		1		2/60			30			8	22	2.0									
13		GER	CS	FK 1109	Physical education.	2	2		2		2/60			30			8	22		2.0								
14		GER	CS	FK 2115	Physical education.	2	3		3		2/60			30			8	22			2.0							
15		GER	CS	FK 2116	Physical education.	2	4		4		2/60			30			8	22				2.0						
16		GER		MNI 3121	Methodology of academic research	5	6	6			5/150	15		30			20	85										
17		GER		Pre 3122	Entrepreneurship			6			5/150	15		30			20	85										
18		GER	ES	OEP 3120	Basics of economics and law			6			5/150	15		30			20	85										
19		GER		OAK 3123	Basics of anti-corruption culture			6			5/150	15		30			20	85										
20		GER		EOBZh 3124	Ecology and life safety fundamentals			6			5/150	15		30			20	85										
21	Technical systems and devices	BS	U	ES 2236	Electronics and circuit engineering	5	3	3			5/150	15	30.0				20	85			5.0							
22		BS	U	CUM 3255	Digital devices and microprocessors	5	5		5		5/150	15	30.0				20	85				5.0						
23		BS	ES	AOS 3274	Administration of cloud systems	4	5	5			4/120	15	30.0				16	59										
24		BS	ES	AS 3269	Network administration			5			4/120	15	30.0				16	59					4.0					
25		BS	ES	SST 3252	Modern agricultural machinery			5			5/150	15	30.0				20	85										

Appendix 1 to the Academic calendar

Appendix 1 to the Academic Calendar

Approved by the Academic Council of the NJSC "S.Seifullin KATIUS", Protocol №16, of 26.05.2023 y.

Schedule of the educational process for the 2023-2024 academic year for the educational program Computer Systems and Vocational Trai faculty

BACHELOR

Courses	September			October			November			December			January			February			Mart			April			May			June			July			August																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6	13	20	27	3	10	17	24	31	7	14	21	28	4	11	18	25	1	8	15	22	29	5	12	19	26	2	9	16	23	30	6

Conventions	PW	presentation week
	•	theoretical training
	TD	enrollment in disciplines
	E	examination session
	H	holidays

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

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	Short description of discipline	Number of loans of credits	Formative learning outcomes														
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12	LO 13	LO 14	LO 15
				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.	Electronics and circuit engineering	Structure and principle of operation of semiconductor devices. Varieties and structure of power sources. Parametric and compensatory voltage stabilizers. Dependent and autonomous voltage inverters. Optoelectronic devices. Circuitry of amplifying devices. Feedbacks of amplifiers. Purpose of feedbacks and ways of their organization.	5							v								
3.	Digital devices and microprocessors	The course covers the key principles of digital electronics, features of digital signals, ways of organizing the interaction of elements, nodes and devices of digital systems. Basic information about	5							v								

		binary logic, digital signals, codes, synchronization, and symbols on diagrams is provided. The principles of construction and application of operational and permanent storage devices are described. The basics of programming of microprocessor systems are considered.															
4.	Automatic control theory	Automatic control theory is a highly developed scientific discipline based on deep philosophical concepts and rigorous mathematical methods. With the development of production and the complication of objects in technology, new management problems arise. Methods of parametric and structural optimization, stochastic and adaptive control, state space, filtering, estimation, and identification are widely used in the research and design of control systems.	5								v				v		
5.	Algebra and geometry	"The purpose of the course is to familiarize students with the basic methods of linear algebra and their applications to problems of analytical geometry. In the center of the presentation is the theory of linear systems of arbitrary form. The classification of finite-dimensional operators over various fields is performed. From a single point of view, based on the apparatus of matrix theory, the problems of classification of curves and surfaces of the second order are considered. The main facts related to the theory of polynomials are presented."	5									v				v	
6.	Mathematical analysis	The aim of the course is to introduce students to the important branches of calculus and its applications in IT. During the educational process, students should learn and be able to apply mathematical methods and	5									v				v	

		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.															
7.	Physics	The discipline studies the basic physical phenomena, fundamental laws and concepts, as well as methods of physical research. Considers techniques and methods for solving typical problems from various fields of physics, introduces modern scientific equipment, forms the skills of conducting an experiment, the ability to highlight specific physical content in applied problems of a future specialty	4							v							
8.	Probability Theory and Mathematical Statistics	The course focuses on the probability and statistics of any events, as well as on the relationship between mathematics and programming through an interdisciplinary training program that deepens the mathematical understanding of probability and develops the skills of logical and algorithmic thinking.	4								v			v			
9.	Discrete Mathematics and Mathematical Logic	The study of discrete objects, the solution of combinatorial problems, the study of types of mappings and binary relations, the reduction of propositional algebra formulas to normal forms, the application of logic algebra to the theory of switching circuits. The capabilities for analysis and synthesis, and mathematical maturity are developing.	4								v			v			
10.	Introduction to programming	The course is designed for studying of algorithms and program development to solve different problems. For this purpose, program structure, principles of construction of algorithms and programs, methods of	6												v		

		solving, algorithmization, programming, debugging and implementation of programs, using the language C++ are considered																
11.	Algorithms and data structures	The concept of the algorithm, algorithms' structure: linear, branched, cyclic. Introduction to algorithms. Sorting, Shell algorithm, search algorithms, recursive algorithm. Formal languages and grammars, automaton Turing machines. Data structure: array, sets, records, stack, linked list, tree, graph, hash table, file. The compression algorithm is the Huffman algorithm, the Euclidean algorithm.	5										v					
12.	Python programming	Students will learn how to edit and manage the Python source code. Dictionaries. Iteration and recursion. Indexed loops. Conditional loops. Introduction to sorting. Sorting algorithms: sorting by selection, sorting by insertion, bubble sort. Complexity of algorithms. Search and sort. Efficient sorting methods: binary or dichotomous research, fusion sort, quick sort	6								v			v				
13.	Object-oriented programming	This course will provide the skills to develop console or windows applications using Java programming language using object-oriented programming concepts. Topics of the course include the OOP paradigm, Java programming, file processing, exceptions, structures, collections, object-oriented programming concepts.	6								v		v					
Cycle of basic disciplines/ Elective Component																		
14.	Basics of anti-corruption culture	The course forms a system of knowledge on combating corruption, and develops on this basis a civil position in relation to this phenomenon. The discipline studies the fundamentals of legislation; normative legal acts, moral and legal	3	v														

		norms.																	
15.	Administration of cloud systems	Basic concepts, logical and physical principles of building computer and telecommunications networks; principles of interaction of computers and network equipment at the hardware and software level; basic knowledge of network technologies that are used at the beginning of work as a network specialist; principles of functioning of computer networks, principles of interaction of network elements, methods of calculation and network construction.	4											v					
16.	Network administration	The study of the discipline involves the formation of knowledge and practical skills in the use of modern technologies for the construction and administration of a local network at the enterprise level. It allows you to get acquainted with the basic data transmission protocols in modern networks, to master modern tools used for local network administration. It helps to master modern software tools that are used in network administration.	4											v					
17.	Ecology, life safety principles and SDG	The discipline studies the interrelation of environmental science with other sciences, the patterns of interaction between organisms and their habitat, the laws of development and existence of biogeocenoses as complexes of interacting living and inanimate components in various parts of the biosphere, the goals of sustainable development (namely, global problems of humanity and ways to solve them), issues of preserving human health and life in the technosphere, protection from hazards of man-made and natural origin and the creation of comfortable living conditions.	3															v	

18.	Professionally-oriented foreign language	To form the professional foreign language speech of future specialists to increase the level of professional competence, proficiency in a professional foreign language for the implementation of written and oral information exchange, further development of speech activity (reading, writing, listening and speaking - monologue and dialogic speech). Rules of speech behavior in accordance with situations of professional communication, depending on the style and nature of communication in the social, household and academic spheres.	3								v						
19.	Modern agricultural machinery	The main directions of development of mechanization of agricultural production. Advanced models of foreign agricultural machinery. The study of the designs of the main mechanisms and equipment of agricultural machinery and the latest equipment and GPS systems that ensure the performance of agricultural work using precision farming technologies.	5		v						v						
20.	Precision agriculture basics	The studying of technological processes of precision farming, the study of the latest laboratory equipment and GPS systems that ensure the implementation of precision farming technologies. The use of parallel and automatic driving systems and the formation of practical skills in working with GIS technologies. Formation of student's system of professional knowledge, skills and abilities on the methods and ways of organizing and reliable operation of complex technical systems for the production of crop	5								v						

		products using precision farming technologies.																	
21.	Metrology, standardization and quality assurance in animal husbandry	Get basic information about standardization, certification and technical metrological measurements, equipment for determining the quality of products in the agro-industrial complex. Interchangeability and standardization of equipment and parts, technical measurements of parts, quality of manufacture, modern agricultural equipment used to assess the quality of livestock products.	5																v
22.	Metrology, standardization and quality assurance in crop production and agriculture	Legislative and regulatory frameworks used by the state system of standardization and certification and metrology in crop production, the use of normative and technical documents of the standardization and certification system, metrology of the CIS countries to overcome technical barriers preventing entry into the world market. Methodology for determining quality indicators in accordance with standards and confirmation in accordance with the Law on Technical regulation	5																v
23.	Fundamentals of agronomy	Formation of knowledge of agricultural crops, conditions and technologies of their cultivation. Types, varieties and varieties of cultivated plants, the peculiarities of growing individual crops taking into account their biological characteristics. The main cultivated plants, their origin, the possibilities of economic use of cultivated plants, the main techniques and methods of crop production.	5						v										
24.	Fundamentals of animal husbandry	Formation of knowledge of the biological features of the main species and breeds of animals bred in	5						v										

		farms of different regions of the country. Reproduction of the herd and directed rearing of young animals. Feeding, keeping, breeding of farm animals and poultry. Technologies of the production of livestock products.																
25.	Animal Morphology	Discipline studies the anatomical structure of the organism of farm animals and its organs, features of the body structure of various types of farm animals, basics of cell structural organization, body tissues of farm animals, students master the basics of cytology, general and private embryology and histology, the nervous system, the circulatory system and lymph formation, the immune system, respiration, digestion, lactation, metabolism, energy, reproduction process.	5						v									
26.	Botany	The discipline studies the anatomical, morphological structure of plants, the structure and functions of the vegetative and generative organs of plants, their significance and the diversity of species common in the experimental sites of the region under study; the main characteristics of plants of various systematic groups. Knowledge of the characteristics of these objects is an important foundation for a deeper consolidation of the studied course.	5						v									
27.	Selection and seed production of agricultural crops	The course studies the concept of a variety, the source material and methods of its creation, the types of plant breeding, the use of biotechnology in breeding, the methods of selection and evaluation of breeding material, the organization of the selection process, the state variety testing and	5						v									

		regionalization of varieties and hybrids, seed production processes, the organization of seed production of individual crops in modern conditions, varietal and seed control in seed cultivation of field crops, varietal change and varietal renewal.																
28.	Breeding and selection of agricultural animals	The discipline studies the basic laws of inheritance signs and principles of heredity in the individual development of agricultural animals, exterior, interior and constitution of agricultural animals; comprise the selection and assortment, genetic parameters of selection, the doctrine of the breed; students master methods of breeding animals; analyzes selection and breeding work in animal husbandry.	5						v									
29.	Fundamentals of computer modeling in agriculture	The discipline is the basic training of students in the theory of mathematical and computer modeling and computer-aided design of systems. Conducting interactive lectures, practical classes and/or active laboratory work using computer presentations. Using a computer testing form/ticket to check students' independent work.	3												v			
30.	Modeling systems in agriculture	Basic concepts of the theory of systems modeling. Mathematical methods of modeling information processes and systems. Network models. Queuing systems. Petri nets. Generalized A-circuit models. Conceptual, algorithmic, static models, modeling of processes in agriculture, to carry out simulation modeling when using agricultural machinery or the operation of an electrical network, to conduct a simulation experiment on a computer	3												v			
31.	Python and data analysis	During the course, students are introduced to the	5							+				+		+		

	(Minor)	rapidly developing field of data analysis with a special focus on the Python programming language. Students will learn the concepts, methods and tools they need in order to draw meaningful conclusions based on the analysis of real economic data. The course is specially designed for people with no prior programming experience.															
32.	Applied statistical analysis (Minor)	The course is aimed at developing students' skills in applying statistical analysis to study data and make informed decisions in various fields. It includes the basics of statistics, analysis methods, statistical programming (R, Python), application in various fields, interpretation of results and implementation of practical projects.	5									+	+		+		
33.	Machine-oriented programming	The main types of registers, the rationale for using the operational and system registers of the microprocessor; the scope of the system command application of microprocessors; system functions and their parameters; flows and processes that are recorded in instances; error handling mechanisms. Conducting interactive lectures, practical classes and/or active laboratory work using computer presentations.	5										v				
34.	Machine Learning	The course introduces students to the theoretical foundations and algorithms of machine learning, their possible practical implementations and application in solving real problems. Within this course, students should get an idea of the problems solved with the help of the considered theory, and the principles of construction of some basic classifiers	5											v			
35.	Plants physiology	Physiology of plant cells. The main parts and properties of the cell.	5					v									

		Water regime of plants. Mineral nutrition of plants. Plant respiration. Photosynthesis. Transformation and transport of organic substances in plants. Growth and development of plants. Integration of physiological processes in the plant. Plant protection and resistance mechanisms.																
36.	Animal Physiology	The discipline forms theoretical knowledge the structural and functional organization of animals, homeostasis, principles of nervous and humoral regulation of functions, physiology of the central nervous system, cardiovascular, digestive and respiratory systems. It studies the physiological processes occurring in the body of animals, the role and physiology of the endocrine glands, the biological significance of energy and metabolic processes, the processes of excretion of vital products of the body.	5					V										
37.	Innovative technologies in livestock	The discipline considers innovative technologies of keeping and feeding animals. Innovative technologies to produce of animal meat, such as beef, lamb, horse meat, poultry and rabbit meat. Innovative technologies to produce of animal milk in various branches like cattle breeding, horse breeding, camel breeding, sheep breeding and goat breeding. Innovative technologies to produce of eggs from different kind of poultry. Innovative technologies to produce of bee products.	5					v										
38.	Information technology in crop production	The discipline is aimed at studying the theoretical and practical knowledge of students about modern geographical information systems, remote sensing of the earth, information systems of control, accounting and monitoring	5					v										

		in relation to agricultural technology; mastering methods of differentiated application of fertilizers and plant protection products, creating a database for the production of crop products, studying statistical and applied programs in crop production.																
Profile disciplines/ University component																		
39.	Embedded systems and the Internet of Things in the agro-industrial complex	Embedded systems and IoT. Embedded system: a computer hardware system with embedded software: surveillance systems, robots, CNC machines, programmable logic controllers, industrial automation and control systems. IoT and digitalization (automation) in agriculture — the creation of complex highly automated production and logistics chains: wholesale and retail trading companies, logistics, agricultural producers and their suppliers.	5												v			
40.	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	
Profile disciplines/ Elective Component																		
41.	Database theory	The concept of a database system, relational databases (tabular models). Transition from data abstraction to transaction management with additional materials to improve query performance. Current trends in the design of database systems, which also determine the latest developments in the broader history of data storage technologies.	4			v												

42.	Database management systems	Learn the basics of databases and database management systems. Know the principles of the relational data model, the basics of working with database management systems, relational algebra and relational calculus. Be able to create databases, administer DBMS, archive data, perform SQL queries, data sampling, search. Have database design and development skills	4			v											
43.	Design and development of Internet applications	Internet technologies. Classification and types of web applications. Web application development tools: HTML5, CSS3; JavaScript and jQuery libraries; basic tools of the Web Matrix development environment. Client-server interaction. Development of client-server applications. Web design.	5													v	
44.	Web technologies	Classification and types of web applications. Web application development tools: HTML, HTML5, CSS3. Client-server interaction. Technologies for developing client-server applications. Installed a website. JavaScript and jQuery libraries. Platform Node.js . Vue frameworks.js , Angular 2 and React 15. CMS systems. A programming interface for accessing and managing the DOM API supported by the web page.	5						+								
45.	Automation of technological processes in animal husbandry	The main feature of the development of automation in animal husbandry is the inextricable connection of technology with biological objects, variable parameters (in time) – animals and birds. The connection of technology and biological objects as a human-machine system, which is caused by: Complexity and diversity of production processes, a variety of technological processes and equipment. Poultry and livestock	5			v											

		industries are also characterized by all groups of automation objects.																
46.	Automation of technological processes in crop production agriculture	The discipline is aimed at mastering the principles of automation of calculations of technological maps and production plans of agricultural production. The study of methods of composing technological mapping of agricultural crops of various crops, the preparation of production plans with the calculation of the required volumes of work, a large number of agricultural machinery and working equipment, stocks of fuel and electric energy, as well as the financing of wages	5				v											
47.	Automation of traceability of livestock products	Owns the principles of automation of agricultural production in animal husbandry. Summary: Automation of technologies for processing, storage and transportation of livestock products. Automation of feed production and animal husbandry. Automation of power supply and water supply	4					v										
48.	Automation of traceability of crop production	The study of the discipline is aimed at mastering the principles of automation of agricultural production. Automation of processing, storage and transportation of agricultural products, phytosanitary safety, the ability to control and monitor processes at all stages of processing and transportation of products. Automation of post-harvest processing and storage modes.	4					v										

49.	Production technology of plant growing products	Theoretical foundations of crop production. Ways to increase the production of field crops. Factors determining the growth, development of plants, yield and quality of the crop. Programming of harvests of field crops. Theoretical foundations of component compatibility in mixed and joint crops. Models of energy-saving technologies for the production of biologically pure agricultural products. Methods of energy assessment of technological techniques. Fundamentals of soil conservation crop production.	5				v											
50.	Production technology of animal husbandry products	Course studies the modern methods of breeding agricultural animals; economic prerequisites of organization and production of livestock products in farms, peasant farms, joint-stock farms of the Republic of Kazakhstan, the CIS countries and other foreign countries; applies the production technologies of livestock products.	5				v											
51.	Geoinformation technologies in agriculture	Data sources are direct measurements in the fields with subsequent interpolation and processing of images from aircraft and space satellites. GIS can solve the problems of accounting for farmland, determining the value of land, monitoring the activities of agricultural enterprises, determining damage and compensation payments in emergency situations, GIS analytical tools solve the problems of increasing the sustainability of agricultural production and reducing its cost.	3				v											
52.	Unmanned vehicles and autopilots	The course introduces the principles of construction and operation of modern unmanned aerial vehicles. Gives concepts about aerodynamics, the main design features of UAV	4					v										

		models. the course discusses the features of the use of UAVs in the study of the soil cover of pastures. Attention is also paid to unmanned tractors and other mechanisms. Parallel driving. The issues of the use of UAVs and autopilots in precision animal husbandry are considered.															
53.	Intelligent logistics systems in the agro-industrial complex	Intelligent control systems. Automation of production is the highest stage of mechanization, computerization of production is the highest stage of its automation, intellectualization of production is the highest stage of computerization. The course includes consideration of intelligent control systems for agricultural machinery, robotic field management systems, intelligent control systems for dairy farms, pig farms and poultry farms, etc. Robots for animal care are considered	5						+								
54.	Logistics in the agro-industrial complex	The use of methods, technologies and artificial intelligence systems in the field of logistics in the agro-industrial complex and supply chain management, ideas about modern concepts and knowledge management systems of the organization. work with intelligent systems in the management of logistics processes. Introduces methods and technologies of knowledge representation and formalization, principles of knowledge management in agricultural organizations, technologies of intelligent search and linguistic data analysis.	4					v									
55.	Intelligent logistics systems of livestock enterprises	Formation of knowledge and skills of using methods, technologies and artificial intelligence systems in the field of logistics in enterprises and supply chain management, as well as ideas about	5					v									

		modern concepts and management systems of the organization. The discipline is focused on obtaining knowledge and practical skills of working with intelligent systems in the management of logistics processes															
56.	Digitalization of agricultural services	To master the modern principles of technical service in the system of the agro-industrial complex Summary: Means of digitalization of the agro-technical service, as well as the system of technical service (TO). The content of digitalization and technology of maintenance of tractors and machines. Types and frequency of maintenance.	4										v				
57.	Theory of electric chains	The course has been designed to introduce fundamental principles of circuit theory commonly used in engineering research and science applications. Techniques and principles of electrical circuit analysis including basic concepts such as voltage, current, resistance, impedance, Ohm's and Kirchhoff's law; basic electric circuit analysis techniques, resistive circuits, 1st order and 2nd order circuits; circuits with DC and AC sources.	4											v			
58.	Fundamentals of mechatronics and robotics	Fundamentals of the design and use of software tools, programming of robotic devices. Mastering knowledge of the theoretical and practical foundations of the design of robotic devices; mastering knowledge about the purpose and capabilities of software for controlling robotic devices; forming skills of working with software and using software tools to solve problems of automation of control of robotic devices.	4									v					