MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN
S. SEIFULLIN KAZAKH AGROTECHICAL UNIVERSITY

Considered at the meeting of the University Academic Council
APPROVED
Protocol № 15
«30» 05 2019 y.

Chairman of the Board of JSC
S Seifullin Kazakh Agrotechnical University
A.K. Kurishbayev
«30» 05 2019 y.

Educational program

«Information systems and IT solutions by industry»

Code and classification of the field of education:
7M06 Information and communication technology
Code and classification of training areas:
7M061 Information and communication technology
Code in the International Standard Classification of Education: **0610**
Classification: master
Training period: *1,5; 1; 2 years*

Nur-Sultan 2019

Author's team:

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5. Kadirkulov Kuanysh Kaisarovich - Director of «Smart Soft Kazakhstan» LLP.

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Educational program Educational program 7M06101 – «Information systems and IT solutions by industry» considered at the meeting of the Department «Information Systems» №9 of «11» May 2023 y.

Approved by the Faculty of the CSaPE
council protocol №12 of «19» May 2023 y.

Passport of the educational program 7M06101 – «Information systems and IT solutions by industry» has been updated in the Unified platform of higher education from 01.08.2023 y.

CONTENTS

1 Passport of the educational program

1.1 The purpose of the educational program: the Formation of students' competencies that ensure their professional activities in the field of information and communication technology and the training of specialists in research, development, implementation and maintenance of information technologies and systems in various sectors of the economy and education.

Objectives of the educational program:

-creation of prerequisites for independent search and research activities of undergraduates in the framework of the experiment at all its stages;

- contribute to work with scientific and technical information, use domestic and foreign experience in professional activities, systematize and generalize the information received;

- the formation of students' knowledge about the principles of design and management of information systems for the effective organization of management processes of information resources and organization systems, as well as the skills of participation of undergraduates in solving real problems of economic sectors.

1.2 Learning outcomes

LO 1. Speak a foreign language to the extent necessary to obtain professional content information and to present their ideas and solutions to professional problems in oral and written forms, as well as use regulatory legal acts and draw up special documentation in professional activities; prepare scientific and technical reports, presentations, scientific publications based on the results of research.

LO 2. Analyze the problems that arise in science at the present stage of its development and use the methodological tools of philosophy for designing complex scientific research, as well as independently plan scientific research, experiments, approaches and methods of data processing, as well as design and implement complex research, including including interdisciplinary, based on a holistic systemic scientific outlook using knowledge in the field of history and philosophy of science.

LO 3. Use modern educational technologies in pedagogical activity, systemic scientific knowledge about the theory and technology of the processes of education and upbringing, independently conduct pedagogical research at the university, as well as professionally formulate and argue their own theoretical position in scientific activity and the educational process

LO 4. Analyze, design managerial activities and use psychological methods of management and self-management in professional activities, as well as use the basic methods of natural sciences in professional activities for theoretical and experimental research.

LO 5. To apply and configure hardware, technologies for building the server infrastructure of the enterprise, to design a complex of information systems and services for development, to describe solutions for the modernization and reorganization of the IT infrastructure of the enterprise, as well as to use the

regulatory framework in solving the tasks of ensuring information security and comprehensive protection of information at the enterprise and in the organization.

LO 6. Organize measures to regulate the quality of information systems in accordance with the established requirements, apply the data processing technology of the integrated quality management system of IP, as well as build conceptual models of information security of the object, formulate the main tasks for creating and ensuring the functioning of an integrated security system at the enterprise and in the organization; including the effective use of cryptographic primitives/protocols to solve applied computer security tasks.

LO 7. Choose IT solutions for business automation and integrate software with other systems to build an optimal IT infrastructure for an enterprise in various areas of the economy, as well as use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information on the research topic.

LO 8. Analyze the IT infrastructure of the enterprise, identify the information needs of users, analyze the methods and models for implementing and adapting information systems and participate in the reengineering of applied and information processes, as well as choose modern technologies, monitoring tools, solutions for automating business processes in digitalization enterprises of various directions, including the development of software solutions based on geosystems.

LO 9. Use methods and algorithms, API services for analyzing large amounts of data in practice, analytics and big data management tools in research, as well as demonstrate mastery of methodological tools of scientific ontology and theory of cognition in the development of modern science and technology, in creative processes in various fields of activity.

LO 10. Apply modern methods for developing technical, informational and algorithmic support for automation and control systems, including developing the architecture of software and hardware systems, as well as using the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information on the research topic.

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

The training of IT specialists who are proficient in modern methods, tools and technologies for the industrial development of software products for various purposes, capable of managing engineering activities and software system life cycle processes is an urgent task of postgraduate education at a university.

An important element that determines the features of the implementation of the educational program is a multi-level system for training qualified personnel in the direction of "Information and Communication Technologies".

The educational program is aimed at acquiring skills and abilities to develop new methods and tools for designing information systems based on modern technologies, to carry out author's support of the processes of design,

implementation and maintenance of information systems and technologies, to develop and study theoretical and experimental models of objects of professional activity in the areas for the purpose of introducing information technologies; organize the interaction between the developer and customer teams, make management decisions in the face of various opinions for enterprises developing information systems and technologies, develop methods for solving non-standard problems and new methods for solving traditional problems using information technology.

The skills acquired by undergraduates in the development of information systems and technologies in various subject areas will help graduates navigate and adapt to dynamically changing trends in modern information flows in various areas of the economy.

The research work of the undergraduate is based on modern theoretical, methodological and technological achievements of science and practice, based on international best practices in the relevant field of knowledge.

A graduate can continue his studies in doctoral studies to obtain a Doctor of Philosophy (PhD) degree in Information and Communication Technologies.

3 Competence model (portrait) of a graduate

3.1 Areas of professional activity: research institutions; government bodies; schools; design organizations; industrial enterprises, including agribusiness and others.

The following areas of professional activity can be distinguished:

Scientific area:

- critical analysis of existing methods for the development of information systems and technologies;
- development of new models and methods for solving problems in various subject areas using information technology;
- analysis of scientific, applied (professional) information, presentation in the form of analytical reports.

Production:

- development of new information systems and technologies for solving modern production problems in various subject areas.

Business:

- development of new information systems and technologies to improve the efficiency of business processes in a modern organization;
- presentation of developed information systems and technologies in a professional business environment.

3.2 Types of professional activity

analytical activity:

- choice of methodology and tools for analyzing and improving the architecture of enterprises;

- analysis of the compliance of business processes and IT infrastructure with the strategies and goals of the enterprise;

organizational and managerial:

- managing the development of electronic regulations for the activities of enterprises and its IT infrastructure;

- development of recommendations for optimizing the costs of maintenance and development of the IT infrastructure;

design:

- project management for the creation and development of enterprise architecture;

research:

- research and development of methods for improving the IT infrastructure of the enterprise;

consulting:

- audit of the existing architecture of the enterprise, its compliance with the strategic goals of the enterprise, the consistency of the components of the architecture;

innovative and entrepreneurial:

- management of innovative and entrepreneurial activities in the field of ICT;

pedagogical:

- development of educational programs and teaching materials for management and IT disciplines.

3.3 General educational competencies

- the ability to communicate in oral and written forms in Russian and foreign languages to solve the problems of professional activity;

- the ability to lead a team in the field of their professional activity, tolerantly perceiving social, ethnic, confessional and cultural differences;

- the ability to explore modern problems and methods of applied informatics and scientific and technological development of ICT;

- the ability to explore the patterns of formation and development of the information society in a specific application area;

- the ability to apply new scientific principles and research methods in practice;

- the ability to professionally operate modern electronic equipment in accordance with the goals of the main educational program of the master's program.

3.4 Core competencies

Learning outcomes are determined on the basis of second-level descriptors and are expressed through competencies. Learning outcomes are formulated both at the level of the entire program and at the level of a module, a separate discipline. Second level descriptors suggest abilities:

1) demonstrate developing knowledge and understanding in the field of

study, based on advanced knowledge of this field, in the development and (or) application of ideas in the context of the study;

2) apply at a professional level their knowledge, understanding and abilities to solve problems in a new environment, in a broader interdisciplinary context;

3) to collect and interpret information for the formation of judgments, taking into account social, ethical and scientific considerations;

4) clearly and unambiguously communicate information, ideas, conclusions, problems and solutions, both to specialists and non-specialists;

5) learning skills necessary for independent continuation of further education in the field of study.

3.5 Professional competencies

research activities:

- research of applied and information processes, use and development of methods for formalization and algorithmization of information processes;
- analysis and generalization of the results of research work using modern achievements of science and technology;

organizational and managerial:

- organization and management of projects on informatization of enterprises;
- making decisions on the organization of the implementation of IS in enterprises;

analytical:

- analysis of information, information and applied processes;
- analysis and selection of architectures of software and hardware systems, methods for presenting data and knowledge;

design:

- definition of a strategy for using ICT to create IS in applied areas, consistent with the development strategy of the organization;
- modeling and design of applied and information processes based on modern technologies.

4 Base of professional practice

The educational program of the scientific and pedagogical magistracy includes two types of practices that are carried out in parallel with theoretical training or in a separate period:

1) pedagogical;

2) research

Pedagogical practice is carried out at the department in order to form practical skills in teaching and learning methods. At the same time, undergraduates are involved in conducting undergraduate classes in the profile disciplines of the EP.

Pedagogical practice is aimed at developing the skills of scientific and teaching activities among undergraduates.

The research practice of the undergraduate is carried out in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data at the place of the dissertation. Research practice is aimed at the analysis and research of various aspects of professional activity, tools and approaches to the implementation of tasks.

The educational program of the specialized master's program includes work practice.

Industrial practice is carried out in order to consolidate the theoretical knowledge gained in the learning process, to acquire practical skills, competencies and professional experience in the master's educational program being trained, as well as to master best practices.

The content of the research (industrial) practice is determined by the topic of the dissertation (project) research.

The basis for passing professional practices are public and private enterprises and organizations that develop, implement and use computer technology and software in various fields.

Undergraduates can undergo research (industrial) practice on the bases of practice of the Department of Information Systems:

No.	Name	Telephone	Mail	Site
1)	Astana IT, Astana, Saryarka Avenue, 31/2	+7 775 188 8007	info@astana-it.kz	http://astana-it.kz
2)	IT Holding Samgau; Astana, st.Imanbayeva, 5V	+7 717228 1815 +7 777003 3311	info@samgau.com	http://samgau.com
3)	Oyul Kazakhstan Association of IT Companies, Astana, KabanbayBatyr Avenue, 6/5	+7 717292 5552		http://itk.kz
4)	JSC “National Infocommunication Holding “Zerde”, Astana, Almaty street, 1	+7 717257 0778		http://zerde.gov.kz
5)	Transtelecom JSC, Astana, Abay Avenue, 13	+7 717260 0029		http://ttc.kz
6)	Net.com LLP, Astana, KazhymukanMunaitpasov street, 22	+7 717 247 8177		http://netcom.kz
7)	Corporate Business Systems, Astana, Kabanbaybatyr avenue, 3	+7 727 262 2218		http://cbs.kz

8)	InesSoft LLP, Astana, Mukhtar Auezov street, 8	+7 717 272 8510		http://inessoft.kz
9)	Training center "Expert-A", Astana, BauyrzhanMomyshuly Avenue, 2/1	+7 771 909 4456 +7 717 262 5266	info@expert-a.kz	http://expert-a.kz
10)	LLP "Somnium Astana", Astana, st.Kunaev, 12/2,	+7 7172 68-98-14;		
11)	JSC "Astana Innovation"			
12)	JSC "Electronic Finance"			
13)	JSC "National Information Technologies" Astana, Astana, st.Orynbor, 8	+7 7172 74-10-70; +7 7172 74-10-81;		
14)	Republican association "Union of Farmes of Kazakhstan"	87019996661; 87172509928; IbraevSerik	ibrayev.sn@gmail.com	www.sfk.kz
15)	LLP "PLATONUS"	87055166919; 87172472525; AidarManas	ISPUSINOV@PLATONUS.KZ	PLATONUS.KZ
16)	Global Services International, MukhitovAzat	87077555273;	maz@gse.kz	
17)	Terra Point LLP	87015333406;	Aida_mullasheva@mail.ru	terrapoint.kz

5 The structure of the doctoral study program

1) The structure of the educational program of the master's program in the scientific and pedagogical direction

No. p / p	Name of cycles of disciplines and activities	General laborintensity	
		in academic hours	in academic credits
1	2	3	four
1.	Theoretical training	2640	88
1.1	Cycle of basic disciplines (DB)	1050	35
1)	University component (VC):	600	20
	including:		
	History and philosophy of science		
	Foreign language (professional)		
	Pedagogy of higher education		
	Psychology of management		
	Teaching practice		
2)	Component of choice (CV)	450	15
1.2	Cycle of major disciplines (PD)	1590	53
1)	University component and (or) elective component		
2)	Research practice		
2.	Research work of a master student	720	24
1)	Research work of a master student, including an internship and a master's thesis	720	24
3	Additional types of training (VET)		
four	Final certification (FA)	At least 240	At least 8
1)	Registration and defense of a master's thesis (OiZMD)	240	8
	Total	At least 3600	At least 120

2) The structure of the educational program of the master's program in the profile direction

No. p / p	Name of cycles of disciplines and activities	General laborintensity			
		with a typical study period of 1 year		with a typical study period of 1.5 years	
		inacademichours	in academic credits	in academic hours	in academic credits
1	2	3	4	5	6
1.	Theoretical training	At least 1170	At least 39	1920	64
1.1	Cycle of basic disciplines (DB)	At least 300	At least 10	450	15
1)	University component (VC)	180	6	180	6
	including:				
	Foreign language (professional)				
	Management				
	Psychology of management				
2)	Component of choice (CV)	At least 120	At least 4	270	9
1.2	Cycle of major disciplines (PD)	At least 870	At least 29	1470	49
1)	University component and (or) elective component				
2)	Internship				
2	Experimental research work of a master student (EIRM)	At least 390	At least 13	540	18
1)	Experimental research work of a master student, including an internship and a master's project	At least 390	At least 13	540	18
3	Additional types of training (VET)				
4	Final certification (FA)	At least 240	At least 8	At least 240	At least 8
1)	Registration and defense of the master's project (OiZMP)	At least 240	At least 8	At least 240	At least 8
	Total	At least 1800	At least 60	At least 2700	At least 90

Annex 1.

Academic calendar

Approve
Chairman of the Academic Council
NJSC "Seifullin KATIUS "
_____ Tireuov K.M.
«29» 05 2023 y.

ACADEMIC CALENDAR
for 2023-2024 academic year
by levels of training
(MASTER)

1	Presentation week, registration for disciplines	1 course August 28 - 31
2	**I semester**	**September 1 - December 15**
3	***Constitution day***	***August 30***
4	Knowledge Day	September 1
5	***Republic Day***	***October 25***
6	***Independence Day***	***December 16***
7	Exam session	December 18 - 29
8	Passing FX	December 18 -29
9	***New Year's Holiday***	***January 1, 2***
10	Holidays	January 1-26
11	**II semester**	**January 29 to May 10**
12	***International Women's Day***	***March 8***
13	***Holiday Nauryz***	***March 21,22,23***
14	***Holiday of unity of the people of Kazakhstan***	***May 1***
15	***Defender of the Fatherland Day***	***May 7***
16	***Victory Day***	***May 9***
17	Exam session	from May 13 to May 24
18	Passing FX	May 13 - 31
19	Registration for the summer semester	May 27 - 31
20	Final examination	until June 30
21	Summer semester	from June 3 to July 12
22	Holidays	from May 27 to August 31
23	***Capital Day***	***July 6***
	Practice*	

Approved by the Academic Council of NJSC «S. Seifullin KATIU», protocol № 16, 29.05. 2023 y.

Note: If it coincides with a weekend or a holiday, the lesson begins on the next working day.

* Types and terms of professional practice are determined by the working Curriculum of Educational Programs.

Appendix 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
MASTER'S DEGREE

Courses	September					October					November				December				January					February			
	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
	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	25	2	9	16	23	1
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
M008 Training of teachers of vocational education. Educational program 7M01401 -"Leadership in professional education"																											
I	PW	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	• /TP/U	E/P	E/P	H	H	H	H	•/U	•/U	•/U	•/U	•/U
II		•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	H	H	H	H	RP/U	RP/U	RP/U	RP/U	RP/U
M094 Information technologies. Educational program 7M06102 - "Copmputing systems and technologies", 2 years																											
I	PW	•	•	•	•	•	•	•	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	H	H	H	H	•/TP	•/TP	•/TP	•/TP	•/U
II		•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	H	H	H	H	•	•	•	•	•
M094 Information technologies. Educational program 7M06103 - "Information business analytics", 2 years																											
I	PW	•	•	•	•	•	•	•	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	H	H	H	H	•/TP	•/TP	•/TP	•/TP	•/U
7M06 Information and communication technology. Educational program 7M06101 – "Information systems and IT solutions by industry"																											
I	PW	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	P/E	P/E	H	H	H	H	TP/U	TP/U	•/U	•/U	•/U
II	PW	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	P/E	P/E	H	H	U/U	U/U	U/U	U/U	•/U	•/U	•/U

Courses	Mart				April				May					June				July					August			
	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26
	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30
	27	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**
M008 Training of teachers of vocational education. Educational program 7M01401 -"Leadership in professional education"																										
I	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	E/S/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	H	H	H	H
II	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	RP/U	FE	FE	FE	FE	FE	FE									
M094 Information technologies. Educational program 7M06102 - "Copmputing systems and technologies", 2 years																										
I	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	E/S/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	H	H	H	H
II	•	•	•	•	RP/U	RP/U	RP/U	RP/U	U	U	E/P	FE	FE	FE	FE	FE	FE									
M094 Information technologies. Educational program 7M06103 - "Information business analytics", 2 years																										
I	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	E/P	E/P	E/S/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	H	H	H	H
7M06 Information and communication technology. Educational program 7M06101 – "Information systems and IT solutions by industry"																										
I	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	P/E	P/E	P/EP/TD	S/H	S/H	S/H	S/H	S/H	S/H	S	S	S	S	S	S	S
II	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	•/U	P/E	FE	FE	FE	FE	FE	FE									

Conventions

PW presentation week
• theoretical training
TD enrollmentin disciplines
E examination session
P passing FX
H holidays
MT military training

S summer semester
FE final examination
EP educational practice
IP industrial practice
PP production and technological practice
U undergraduate practice
TP teaching practice

Annex 2.

Working curriculum.

of Academic Council
of the University
Protocol № ____
"___" _____ 20___ y.

Member of the Board
Vice-Rector for Academic Affairs
NC JSC "KATIU"
_____ Abisheva R.D.
"___" _____ 20___ y.

WORKING CURRICULUM
for 2023-2025 academic year
For the modular education program "Information systems and IT solutions by industry"
by the speciality/group of educational programmes M094 – Information technology
Degree: Master's program by specialization (Scientific & pedagogical direction)
Form of education: Full-time (MS 2 years) semester
Entry year: 01-09-2023

Module code	Module name	Discipline cycle	Discipline	Code of subject	Subject name	Academic credits	Control in the academic period					Volume of hours		including			Self-study work of Ms stude	Self-study work of Ms stude	Distribution of credits per 1 course		2 course	
							Exams	Differentiated test(practi	Differentiated test(course paper)	Practice/SRW	Term paper/project	Total	In-class learning	Lectures	Practice	Lab practicals			1	2	3	4
																			Number of weeks in the academic period			
																			15	15	15	15
					General modules																	
1	Socio-political and linguistic	BS	U	PVSH 5203	Pedagogics of higher school	3	1					90.0	30.0	15	15	0	12	48	3.0			
2		BS	U	PU 5204	Psychology of management	5	1					150.0	45.0	15	30	0	20	85	5.0			
3		BS	U	IYaP 5202	Foreign language (professional)	5	1					150.0	45.0	0	45	0	20	85	5.0			
4		BS	U	IFN 5205	History and philosophy of science	5	1					150.0	45.0	15	30	0	20	85	5.0			
					Modules of specialty/education programm																	
5	Professional practic	BS	U	PP 5216	Pedagogical training	2				60		60.0		0	0	0	0	0		2.0		
6		AS	U	IP 6315	Research practice	8				240		240.0		0	0	0	0	0				8.0
7	Theoretical aspects of IP design	AS	U	MMNI 5301	The methodology and methods of scientific experiments	6	1					180.0	60.0	30	30	0	24	96	6.0			
8		AS	U	AMPI 5302	Analysis and modeling of information systems	6	2					180.0	60.0	30	30	0	24	96		6.0		
9		BS	E	KOIBP 5210	Comprehensive information security of the enterprise	5	2					150.0	45.0	15	30	0	20	85		5.0		
10		BS	E	KMZI 5214	Cryptographic methods of information protection		2						45.0	15	30	0	20	85				
11		AS	E	MAOD 5311	Methods of data analysis and processing	5	2					150.0	45.0	15	30	0	20	85		5.0		
12		AS	E	IAOD 5317	Data analysis and processing tools		2						45.0	15	30	0	20	85				
13		BS	E	UKIS 6207	Quality Management of Information Systems	5	3					150.0	45.0	15	30	0	20	85			5.0	
14		BS	E	AIS 6215	Audit of information systems		3						45.0	15	30	0	20	85				
15	Practical aspects of IS design	AS	U	IRDB 5309	IT solutions for business	6	2					180.0	60.0	30	30	0	24	96		6.0		
16		AS	U	VOM 6308	Introduction to Ontological modeling	5	3					150.0	45.0	15	30	0	20	85			5.0	
17		BS	E	PIIP 6206	Design of enterprise IT infrastructure	5	3					150.0	45.0	15	30	0	20	85			5.0	
18		BS	E	IM 6213	Information management		3						45.0	15	30	0	20	85				
19		AS	E	CSP 6306	Digitization of an agricultural enterprise.	5	3					150.0	45.0	15	30	0	20	85			5.0	
20		AS	E	CTAK 6316	Digital technologies in the agro-industrial complex		3						45.0	15	30	0	20	85				
21		AS	E	OIP 6310	Enterprise cloud infrastructure	6	4					180.0	60.0	30	30	0	24	96				6.0
22		AS	E	OTP 6319	Cloud technologies in practice		4						60.0	30	30	0	24	96				
23		AS	E	TB 6314	BigData Technologies	6	3					180.0	60.0	30	30	0	24	96			6.0	
24		AS	E	BP 6318	BigData in practice		3						60.0	30	30	0	24	96				
					Scientifically research																	
25	The research work	R	C	NIRMVVMD	Master student's research work, including implementation of master's	6				180		180.0		0	0	0	0	0	6.0			
26		R	C	NIRMVVMD	Master student's research work, including implementation of master's	6				180		180.0		0	0	0	0	0		6.0		
27		R	C	NIRMVVMD	Master student's research work, including implementation of master's	4				120		120.0		0	0	0	0	0			4.0	
28		R	C	NIRMVVMD	Master student's research work, including implementation of master's	8				240		240.0		0	0	0	0	0				8.0
Total of theoretical course						112	15	0	0	1020	0	3360	735	285	450	0	312	1293	30.0	30.0	30.0	22.0
AC	**Additional courses**											0										
FA	**Final attestation**					8						240.0										
	Master's thesis defense					8				4		240										
	Total					120				1024		3600	735	285	450	0	312	1293				

Appendix 3. Achievability matrix of the formed learning outcomes in the educational program with the help of academic disciplines.

No.	Name of the discipline	Brief description of the discipline	Number of credits Comrade	Formed learning outcomes									
				LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10
	Cycle of basic disciplines University component												
1.	Psychology of management	Introduction to the psychology of management. Conceptual apparatus of the psychology of management. Leader and team. Conflicts in the workplace. Managerial communication. Decision making technology. The concept of the subject and object of management. Leader and leader. Psychology of the order. Personality as a subject and object of management. Democratic leadership style and its features. Psychology of criticism. Psycho types of subjects of communication. Psychological persuasive technique. Psychological problems of selection of leading cadres. Psychological problems of training and retraining of managerial personnel. Selection and placement of personnel. Staff rotation. Certification and staff turnover.	5		ˇ	ˇ	ˇ						
2.	History and philosophy of science	The structure and functions of scientific knowledge, methods of science in their professional activities; differences between ideological, political, religious constructions from scientific concepts. Means and methods of modern science, analysis of philosophical and ideological, epistemological, logical and methodological issues, the style of scientific thinking	5	ˇ	ˇ	ˇ							
3.	Pedagogics of higher school	Fundamentals of pedagogy of high school. Subject and tasks of pedagogy of higher school. Methodology and methods of pedagogical research in higher education. Didactics of higher school. Pedagogical process in higher school. Laws and principles of training. Methods, forms and means of higher education. The current state of higher education in the Republic of Kazakhstan. Professional development of a teacher of higher education. The process of education in higher education. The purpose of education as a pedagogical problem. Teaching and educational team as a form of functioning of a holistic pedagogical process.	3	ˇ	ˇ	ˇ							
4.	Foreign language (professional)	Language for professional and academic purposes at an advanced level, which will allow to freely operate with the scientific and conceptual apparatus of the specialty, expand the scientific and information base, master the skills of interpreting scientific information, argumentation, persuasion, scientific controversy, academic writing	5	ˇ	ˇ	ˇ							
5.	**Cycle of basic disciplines Optional component**												
6.	Cryptographic methods of information protection	The study of the main mathematical approaches to solving computer security problems and to the construction of modern cryptographic algorithms, modern cloud solutions and computing. It contributes to the development of creative abilities of undergraduates, the use of a mathematical apparatus to derive the properties of the methods being developed, to apply and independently improve their knowledge in the field of cryptography and information security. To acquaint undergraduates with modern	5					ˇ	ˇ	ˇ			ˇ

		scientific research in the field of cryptography and related applied areas, to contribute to the formation of directions for their own scientific research.											
7.	Audit of information systems	The history of the IP audit. Audit of information systems: concept, goals, objectives, standards, stages of audit. The state of the IT audit market in Kazakhstan: companies, types of services. IT infrastructure: concept, composition, security, configuration, management. The main types of IT audit: goals, objectives, brief description. IT audit in preparation of the company for certification according to international standards. IT audit before restructuring of IT departments. IT audit before the implementation of the information system. IT audit before the implementation of IT infrastructure configuration management systems. Information security audit. The methodology of the IP audit: audit planning, stages, problems during the audit and methods of their solution, the choice of a source of funding. Characteristics of IP audit standards. Conducting diagnostics and optimization of IS.	5					ˇ	ˇ	ˇ	ˇ		
8.	Quality Management of Information Systems	In this discipline, undergraduates will be presented with the requirements for information systems for standards, rules and norms approved by the authorized bodies of the Republic of Kazakhstan, as well as rules for the development of technical specifications, technical specifications for the development of information systems. The tasks, functions, structure, data processing technology of an integrated information system quality management system, as well as its creation, operation and development will be considered.	5					ˇ	ˇ	ˇ	ˇ		
9.	Information management	Principles and methods of information management in the system of internal and external communications of the organization. Theoretical foundations and skills of describing and regulating information flows carried out within an organization, between an organization and its near and far environment. The current level of information technology development, with various types of information systems and information resources. Fundamentals of information description and modeling of business processes of the organization.	5					ˇ	ˇ	ˇ	ˇ		
10.	Comprehensive information security of the enterprise	The concept of building an enterprise security system: definition and basic concepts of a security system, information protection in an enterprise security system, conceptual models of the components of an enterprise security system. Legal basis for the activity of the enterprise security service: organizational and functional documents of the enterprise security system, types of regulatory documents. Organizational design of the activity of the enterprise security service. The structure and functions of the enterprise security service: building a structural diagram of the enterprise security service management. Organization ofinformationsecurity service. Enterprise security management.	5					ˇ	ˇ	ˇ	ˇ		
	Cycle of major disciplines University component												
11.	Design of enterprise IT infrastructure	n this discipline, materials will be presented on hardware, software, network solutions, hosting and Internet providers, methods and algorithms for organizing an	5						ˇ	ˇ	ˇ	ˇ	

		enterprise's IT infrastructure. Designing a complex of interconnected information systems and services ensuring the operation and development of the enterprise. Modern technologies, methods and tools for managing the enterprise's IT infrastructure; implementation of projects for the development of information systems in various fields, optimization of the functioning of business processes.											
12.	Analysis modeling and IC design	In this discipline, undergraduates will be presented with materials on the analysis, modeling and design of information systems. Practical assignments will be designed so that students independently visit an enterprise or university, or an object of interest and make an analysis of work processes, develop a model based on the analysis and design an information system.	6				ˇ			ˇ	ˇ	ˇ	
13.	IT solutions for business	In this discipline, undergraduates will be presented with an overview of business automation solutions: accounting, HR, sales, inventory control, production sites, as well as a brief overview of business processes that are often found in business. And also the requirements for the IT platform for the solution will be considered. Building an optimal IT infrastructure of the enterprise based on the business strategy of the enterprise. Practical tasks to strengthen the knowledge gained	6						ˇ	ˇ	ˇ		ˇ
14.	The methodology and methods of scientific experiments	To analyze the trends of modern science, to determine promising areas of research in the subject area of professional activity, the composition of research papers, determining their factors; to use experimental and theoretical research methods in professional activities; to adapt modern achievements of science and science-intensive technologies to the educational and self-educational process.	6	ˇ	ˇ							ˇ	ˇ
	Cycle of major disciplines Optional component												
15.	Introduction to ontological modeling	Computer and mental tasks. Ontological modeling: goals and means. Introduction to ontological modeling. Principles of construction of conceptual and information models. Technological implementation of semantic models. Computer technologies for semantic modeling. RDF, RDFS and OWL. Simple ontological models: creating classes. Technologies for the use of ontological models in information systems. Ontological model as a graph. Machines and rules of inference. Application software for working with semantic models. Methodological issues of ontological modeling. Modeling of complex systems. Grouping methods in ontological modeling. Applications of ontological models in scientific research.	5		ˇ					ˇ	ˇ	ˇ	
16.	Digital technologies in the agro-industrial complex	Introduction to the discipline. Goals and objectives of digitalization (historical aspect of the development of digital technologies). The use of digital technologies in various sectors of the agro-industrial complex: from GIS to the Internet of things.Information support for decision making. Planning of agrotechnical operations. Classification of information and digital technologies. Methodological and theoretical foundations of modeling and design. Model for optimizing the structure of agricultural land. Forecasting crop yields based on trend models. Applied aspects of	5					ˇ	ˇ	ˇ	ˇ		

		the introduction of digitalization in the branches of the agro-industrial complex.											
17.	Digitization of an agricultural enterprise.	In this discipline, undergraduates will be presented materials on the opportunities, tools and technologies for digitization of agricultural sectors in areas such as Agronomy and agricultural engineering; Animal husbandry; Veterinary medicine, where software solutions on the market, main business processes with the principles of digitalization will be considered.	5					ˇ	ˇ	ˇ	ˇ		
18.	Cloud technologies in practice	In this discipline, undergraduates will be presented with materials on the practical application of cloud technologies, the study of services and providers of cloud platforms. Practical tasks will strengthen skills in the application of cloud solutions	6					ˇ	ˇ	ˇ		ˇ	
19.	Methods of data analysis and processing	Data analysis as a systematic scientific and practical activity. Introduction to data analysis. Basic theoretical concepts underlying data analysis. Areas of application of modern technologies of data analysis and processing. Stages of data analysis. Structured and unstructured data. Collection and preparation of data. Big data. Organization of collection and storage of large data sets. Recovery of missing values in data arrays. Big data. Organization of collection and storage of large data sets. Cleansing, integrating and transforming data. Program modules and packages for working with multidimensional data arrays. Data visualization. Theory of Probability and Mathematical Statistics. Machine learning methods	5					ˇ		ˇ		ˇ	ˇ
20.	Data analysis and processing tools	Fundamentals of working with data. Theoretical and methodological foundations for working with data. Methods for working with data. Development of an empirical research program. Statistics using language. Programming in R. Descriptive statistics using R. Building a multiple regression model in R. Network analysis using PAJEK. Building a network using PAJEK software. Using classifications to organize data. Calculations of vertex centralities and network centralization. Collection of text data. Types of data generated by users, approaches to obtaining and systematizing them. Data collection via API. Collecting data without using an API. Website scraping software. Features of working with "big data". Specific tools for IAS and BI. Data source analysis. Designing Data Marts for Analytical Solutions in Columnar DBMS. Compilation of SQL queries to the data mart. Advanced data sampling. Data visualization.	5					ˇ		ˇ		ˇ	ˇ
21.	Enterprise Cloud Infrastructure	Digital transformation of the enterprise, services of cloud providers, a set of hardware (hardware) and software (software) components to support the provider's cloud services, cloud services, access to and management of hardware resources, scaling the enterprise's IT infrastructure. Types of cloud infrastructures: public clouds, dedicated	6					ˇ	ˇ	ˇ		ˇ	

		private cloud (VPC), private clouds, hybrid clouds, benefits of cloud infrastructure, main physical components of cloud infrastructure: servers, storage and network equipment, cloud infrastructure models. virtualization platforms.											
22.	BigData in practice	In this discipline, undergraduates are offered a brief overview of The bigdata concept, tools available on the market of software solutions, as well as materials about their use on raw data. API services, examples of their use. Data collection and processing, understanding the work in Hadoop and Map Reduce programs, determining the big data characteristics necessary for improvement, working with cloud platforms. Tools, methods and techniques for processing large amounts of data.	6							ˇ		ˇ	ˇ
23.	BigData Technologies	Definition of big data. Big data storage technologies. The process of analyzing big data. Big data analysis technologies. Scientific problems in the field of big data. Methods and techniques of analysis applicable to big data: methods of the Data Mining class: learning associative rules, cluster analysis, regression analysis; crowdsourcing, mixing and integration of data, machine learning, including teaching with and without a teacher, as well as Ensemble learning, artificial neural networks, network analysis, optimization, including genetic algorithms; pattern recognition; Forecasting methods. Statistical information processing programs.	6							ˇ		ˇ	ˇ