KAZAKH AUTOMOBILE ROAD INSTITUTE
named after L. B. GONCHAROV

"APPROVED"
Rector KazARI
named after L.B. Goncharov
R.A. Kabashev
_____
_____ 25 april _____ 2023

MODULAR EDUCATIONAL PROGRAM

Code and classification of training areas:
6B061 Information and communication technology
Name: 6B06106 - «Information Systems»
Level of training: bachelor degree

Almaty 2023

The modular educational program in the direction of the preparation of the ICT educational program 6B06106 - "Information Systems" was drawn up in accordance with the State Educational Standard of Higher Education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 № 604 (as amended on 23.07.2021); Classifier of areas for training personnel with higher and postgraduate education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 13, 2018 № 569 (as amended on June 5, 2020); Classifier of occupations of the NK RK 01-2017, approved by the Order of the Committee for Technical Regulation and Metrology of the Ministry for Investment and Development of the Republic of Kazakhstan dated May 11, 2017 № 130) -od., Methodological recommendations for universities on the design of educational programs, MES RK, 06.11.2020, normative documents of KazARI.

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The modular educational program was discussed at the meeting of the Department "HK, GED and IS" and recommended for approval.
Protocol №__ from "___" april 2023

The modular educational program was reviewed at the meeting of KazARI Education and Methodological Council and recommended for approval.
Protocol №__ from "___" april 2023

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

KAZAKH AUTOMOBILE ROAD INSTITUTE named after L. B. GONCHAROV

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CONTENT

1 PASSPORT OF THE EDUCATIONAL PROGRAM

1.1 Explanatory note

With the intensification of globalization and integration processes, human capital acts as a tool to increase the country's competitiveness. For successful competition on the world stage, countries need to train highly qualified personnel who can use their knowledge and skills to develop the country's economy. Human capital is considered as the basis for economic growth in connection with the departure of many countries from the raw material orientation of the economy, labor-intensive production and stimulating the development of innovations and technologies. Therefore, special emphasis is placed on the development and improvement of the quality of higher education, which is aimed at the formation of demanded personnel in accordance with the new realities. The new education system in Kazakhstan is a stage in the creation of an effective educational model, the purpose of which is to increase the functional literacy of university graduates.

The educational program is developed in accordance with the following regulatory documents:

1) State program for the development of education and science of the Republic of Kazakhstan for 2020-2025 Decree of the Government of the Republic of Kazakhstan dated December 27, 2019 №988

2) Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education" (with amendments and additions as of 05/03/2022)

3) Rules for organizing the educational process in credit education technology, approved by Order of the Minister of the Ministry of Education and Science of the Republic of Kazakhstan №152 dated April 20, 2011 (as amended on May 6, 2021);

4) State compulsory standard of higher education, approved by Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604. Registered with the Ministry of Justice of the Republic of Kazakhstan on November 1, 2018 №17669 (as amended on July 23, 2021)

5) Professional standard "Development of high-load and real-time applications" Appendix №32 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated December 24, 2019. №259

6) Professional standard "Business analysis in information and communication technologies" Appendix No. 2 to the order of the acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №222 dated December 5, 2022.

7) Professional standard "Software developers and specialists in testing, web and multimedia applications" Appendix No. 2 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №330 dated December 5, 2018

8) Professional standard "Creation and management of information resources" Appendix No. 8 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №171 dated July 17, 2017

9) Professional standard "Development of technical documentation" Appendix №8 to the order of the acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №222 dated December 5, 2022.

10) Professional standard "Database Administration" Appendix No. 1 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №222 dated December 5, 2022.

11) Professional standard "Testing multimedia applications (including computer games)" Appendix No. 21 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" №222 dated December 5, 2022.

12) Industry qualification framework "Information and communication technologies" Approved by the minutes of the meeting of the Industry Commission in the field of information, informatization, communications and telecommunications dated December 20, 2016 №1

13) National classifier of the Republic of Kazakhstan. Classifier of occupations NK RK 01-2017

14) Regulatory documents of KazADI.

The educational program of specialty 6B06106 - "Information Systems" is implemented on the basis of State license number KZ59LAA00017181, issued by the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan dated October 10, 2019 and certificate No. AB3539 dated June 11, 2021, specialized accreditation Independent Agency for accreditation and rating for the educational program 6B06106 "Information Systems" for a period of five years (06/11/2021 – 06/10/2024)

The educational program "Information Systems" has two learning paths:

1) Information systems in the road sector.

2) Information systems in business and management.

The mission of the educational program is focused on providing high quality educational services in the field of higher education while training spRCialists who will have knowledge of the methodological foundations of designing and implementing automated information systems, modern technologies of developing information systems, administering and designing databases, server and network infrastructure in implementation projects.

The objective of the educational program is to train broad-based specialists with a focus on the implementation of Kazakhstan and international high-tech projects and work in companies with significant intellectual capital, as well as in high-tech companies offering innovative methods and developments in the field of automated information systems, the information technology industry and the automotive transport.

1.2 Terms and definitions

In this educational program, terms and definitions are used in accordance with the Law of the Republic of Kazakhstan "On Education", as well as terms adopted in the Kazakh Automobile and Road Institute named after L.B.Goncharov (KazARI):

Higher special education is an educational program of higher education aimed at training specialists with qualification in the relevant specialty with a normative education period of at least 4 years.

Bachelor - an academic degree awarded to persons who have mastered the relevant educational programs of higher education.

Type of professional activity – methods, ways, techniques, the nature of professional activity impact on the objects in order to change it, transform.

Dublin Handle - The European Higher Education Qualification Framework. Describes in a generalized form the learning outcomes for different skill levels. The system of descriptors is invariant, i.e. not tied to a specific educational context, which facilitates the comparison of qualifications. Dublin descriptors represent the agreed requirements for the assessment of learning outcomes in each cycle of higher education and can be applied in national higher education systems with a greater degree of detail.

Credit unit (credit) - a measure of the complexity of the educational program.

Competences - the ability to practical use acquired in the process of learning knowledge and skills in professional activities;

Inclusive education is a process that ensures equal access to education for all students, taking into account special educational needs and individual opportunities.

Module - a set of parts of the discipline (course) or disciplines (courses), which has a certain logical completeness in relation to the established goals and results of education, training.

National qualification framework - a structured description of the qualification levels recognized in the labor market.

National qualifications system - a set of mechanisms of legal and institutional regulation of supply and demand for qualifications of specialists from the labor market.

The direction of training is a set of educational programs of various levels aimed at training specialists for the relevant professional field.

Sectoral Qualifications Framework - A structured description of the qualification levels recognized in the industry.

The field of professional activity is a set of objects of professional activity in their scientific, social, economic, industrial manifestation.

The object of professional activity - systems, objects, phenomena, processes, which are dirRCted to impact.

A professional group is a set of professional subgroups that has a common integration basis (similar or similar purpose, objects, technologies, including means of labor) and assumes a similar set of labor functions and competencies for their implementation.

A professional subgroup is a set of professions formed by an integral set of labor functions and competencies necessary for their fulfillment.

Professional standard - a standard that defines the requirements for the level of qualification and competence, content, quality and working conditions in a specific field of professional activity.

Profession is the main occupation of a person's labor activity, requiring certain knowledge, skills and practical skills acquired as a result of special training and confirmed by relevant documents on education.

Learning outcomes - acquired knowledge, skills and acquired competencies.

Labor function - a set of interrelated actions aimed at solving one or more tasks of the labor process.

KazARI is a higher education institution that:

- implements educational programs of higher and postgraduate professional education in a wide range of areas of training;

- performs fundamental and applied research in a wide range of sciences.

2 DESCRIPTION OF THE EDUCATIONAL PROGRAM

The purpose of the educational program	Providing comprehensive and high-quality training of qualified, competitive specialists for research, development, implementation and maintenance of information systems and technologies through the development of personal qualities in students and the formation of general cultural and professional competencies in accordance with SES.
Training of the map dirRCtion in the educational program	
Code and classification of the field of education	6B06 Information and communication technology
Code and classification of the edacational training	6B061 Information and communication technology
Code and name of the educational program	6B06106 - Information sistems
Qualification characteristics of the graduate	
Academic degree	Bachelor in Information and Communication Technology for the educational program 6B06106-Information Systems
The list of professions	Graduates of the specialty 6B06106 - "Information Systems" can work in the following positions: software engineer; analyst programmer; Specialist in support of EP / PP; software architect; Mobile app developer; multimedia developer; software developer; web master; website designer; ICT business analyst; ICT auditor; artificial intelligence engineer; systems consultant; system engineer; computer game developer; IT designer; System Administrator; network engineer; network administrator; information security auditor; information security specialist; database maintenance engineer; DB administrator; IT infrastructure architect; BigDate Specialist; Project Manager in the field of information technology; Highly loaded application development specialist; specialist for the development of technical documentation (technical writer); Content manager;
Professional field	Industry, science, education, culture, health, agriculture, government and other areas of human activity, directly or indirectly related to information systems and technologies.
The object of professional activity	The objects of professional activity of bachelors are: information processes, technologies, systems and networks, their instrumental (software, technical, organizational) software, methods and methods of design, debugging, production and operation of information technologies and systems.
Functions of professional activity	Design and development of highly loaded systems. Administration and operation of software and hardware of highly loaded systems. Monitoring the content of the organization's Internet resources.

	Office of IP organization. Support for the processes of modernization and promotion of the organization's Internet resources. Planning and designing a game architecture and developing a code algorithm. Implementation of technical standards in the gameplay, graphics, sound and functionality. Obtaining source materials for the development of technical documentation. Development of a documentation plan. Development of technical documentation. Testing technical documentation. Duplication and distribution of technical documentation. Installation and configuration of software. Maintenance and functioning of the database. Monitoring and managing database backups. Provision of information security database. Analysis and tuning of DBMS performance. Ensuring the uninterrupted operation of the DBMS. Database Development Management. Planning for business analysis and monitoring their implementation. Management of requirements for business processes and / or ICT projects of an organization. Evaluation and decision-making to improve the business processes and / or ICT projects of the organization. Design and development of highly loaded systems. Administration and operation of the software and hardware of highly loaded systems. Analysis of software requirements and coordination of the development of technical specifications. Coordination and design of software.
Types of professional activity	Execution and management activities within the framework of the enterprise's activity strategy, involving work on complex tasks, where the analysis of the situation or information requires an in-depth assessment of various factors, as well as the management of employees with responsibility for the result on a specific part of the technological process in a structured unpredictable environment. Developed ability to show in-depth knowledge and skills in the technical field. Demonstrates leadership and is responsible for the effectiveness of the team, for its development in an unpredictable environment. Management activities in the framework of the enterprise's activity strategy, which involves the management of a group or at the unit level with the adoption of responsibility for their own activities and the effectiveness of the team in a structured, unpredictable environment. Developed ability to apply communication skills depending on the specific situation.
Personal competency requirements	Responsibility. Diligence. Logical thinking. The flexibility of thinking. Focus on the result. Organization. Initiative. Mindfulness. Discipline. Decision making. The desire to improve the professional level of creativity, teamwork.
List of competencies	**(EC-1):** understand the surrounding reality on the basis of ideological positions, formed by the knowledge of the foundations of philosophy, which provide scientific understanding and study of the natural and social world by the methods of scientific and philosophical knowledge. **(EC-2):** own a cognitive-linguistic-cultural methodology for solving communication problems in a multilingual and multicultural society of

	the Republic of Kazakhstan.
	(EC-3): show citizenship based on a deep understanding and scientific analysis of the main stages, patterns and originality of the historical development of Kazakhstan.
	(EC -4) use scientific methods and techniques for researching a specific science; summarize the results of the study; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis.
	(EC-5): to develop one's own moral and civic position: to operate on the social, business, cultural, legal and ethical standards of Kazakhstani society; put into practice knowledge in the field of social sciences and humanities, which are recognized worldwide.
	(EC-6) assess situations in various spheres of interpersonal, social and professional communication, taking into account the basic knowledge of sociology, political science, cultural studies, psychology.
	(EC-7): to analyze the particular and general problems of the functioning of the biosphere and environmental management in order to reduce the impact on human health and the environment.
	(EC-8): independently apply modern computer technologies to solve research and production-technological problems of professional activity.
	(EC-9): demonstrate personal and professional competitiveness: build a personal educational path for self-development and career growth, focus on a healthy lifestyle to ensure a full social and professional activity through physical culture methods and means.
	(BC-1): demonstrate basic knowledge in the field of mathematics and natural sciences, their use in their professional activities.
	(BC-2): to realize the need to form new competencies to solve practical problems in the field of information systems and tRChnologies.
	(BC -3): use communication opportunities in oral and written form in the state, Russian and foreign languages for solving problems of interpersonal and intercultural interaction.
	(BC-4): build work in a team, tolerate social, ethnic, confessional and cultural differences.
	(BC-5): to realize the need for self-organization and self-education, to critically rethink the accumulated experience, to change, if nRCessary, the type and nature of their professional activities.
	(BC-6): understand the nature of entrepreneurship and ways of managing it as a process, identifying areas in which entrepreneurship manifests itself, including a startup in professional activities.
	(BC -7): use in the professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protRCting and distributing information).
	(PC-1): demonstrate possession of the tRChniques and methods of operation of modern computing equipment and equipment.
	(PC -2): apply methods and means of protRCting information infrastructure, information resources and tRChnologies.
	(PC-3): dentify requirements for the design of network architRCture, software and hardware of the computer network.
	(PC-4): develop, adapt and implement highly loaded applications

	software. **(PC-5):** develop information systems infrastructure, including databases, operating systems, application software, etc. **(PC-6):** apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools. **(PC -7):** prepare tRChnical documentation for designing information systems and developing software.
Training results	After successful completion of the educational program, the student will: **ON1:** possess a system of subject, psychological, methodological, social, humanitarian, environmental, economic knowledge, the ability to carry out their further professional development, including using their own physical activity in combination with other cultural values. **ON 2:** convince, argue your position during discussions, both on historical and professional topics, legally competently present legal acts; have the ability to quickly adapt when the situation changes due to the possession of extra-functional and multi-professional knowledge and abilities. **ON3:** engage in communication in oral and written forms in Kazakh, Russian and foreign languages to solve problems of interpersonal, intercultural and industrial-professional communication (know the terminology for drawing up software and technical documentation for supporting information systems in Kazakh, Russian and English). **ON4:** master mathematical modeling methods for solving specific engineering problems, including the ability to identify the natural scientific essence of problems arising in the process of professional activity, and the ability to attract the appropriate physical and mathematical apparatus to solve them. **ON5:** have in-depth knowledge of modern methods and tools for designing information systems, create technical documentation of the designed system, organize its information protection. **ON6:** Work in an international context, using innovative experience in the field of information systems and ICT from leading countries of the world; generalize and synthesize new knowledge. **ON7:** Possess skills in using application software packages for calculations, modeling and automation of the design of information processes and systems. **ON8:** Use various types of ICT: Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information, comply with requirements for the accessibility of information resources for persons with disabilities. **ON9:** Use computer technology and programming tools for the effective implementation of hardware and software systems **ON10:** Develop and use technical, software, supporting documentation of various types based on domestic and foreign documentation standards (ISO 9000 series, ISO 14000 series, ISO 22000 series standards, standards in the field of occupational safety management, elements of social responsibility, etc.). **ON11:** Apply skills of entrepreneurship, innovation, creativity, business

	process reengineering, in order to manage possible risks in business processes, develop startups, digitalize business processes; develop business cases; use benchmarking for the effective functioning of the organization and proposed solutions to improve the organization's business processes and/or ICT projects. ON12: Be able to develop models of information system components, models of human-electronic computer interfaces, computer games based on the principles of the circuitry fundamentals of computer technology, principles of organizing internal and external storage devices, adapt and modernize DBMS applications, ensure the security and integrity of data information systems.

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3 MATRIX OF COMPLIANCE OF TRAINING RESULTS ON THE EDUCATIONAL PROGRAM IN GENERAL WITH FORMED COMPETENCES

	ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9	ON10	ON11	ON12
RC1	+	+										
RC 2			+	+								
RC 3		+	+									
RC 4	+	+										
RC 5		+		+						+		
RC 6	+		+	+								
RC 7	+				+		+					
RC 8					+	+	+	+				
RC 9	+		+			+						
BC1	+				+				+			+
BC 2						+		+		+	+	
BC 3			+	+								
BC 4		+	+	+								
BC 5			+			+		+			+	
БС6						+					+	
BC7					+		+	+	+			
PC1			+				+	+				
PC2					+			+	+			
PC3					+		+			+		+
PC4					+		+		+	+		+
PC5								+	+			+
PC6					+	+		+				
PC7					+		+			+		

4 COMPETENCE MAP

General educational competencies	Training results
(RC-1)	TR1; TR 2
(RC -2)	TR 3, TR 4
(GRC -3)	TR2, TR 3
(GRC -4)	TR 1, TR 2
(GRC -5)	TR 2, TR 4, TR 10
(GRC -6)	TR 1, TR 3, TR 4
(GRC -7)	TR 1, TR 6
(GRC -8)	TR 5, TR6, TR 7, TR 8
(GRC -9)	TR1, TR 3, TR 6
Basic competencies	**Training results**
(BC-1)	TR 1, TR 5, TR 9, TR 11
(BC -2)	TR 6, TR 8, TR 10, TR 11
(BC -3)	TR 3, TR 4
(BC -4)	TR 2, TR 3, TR 4
(BC -5)	TR 3, TR 6, TR 8, TR 11
(BC -6)	TR 6, TR 11
(BC -7)	TR 5, TR 7, TR 8, TR 9
Professional competences	**Training results**
(PC-1)	TR 3, TR 7, TR 8
(PC -2)	TR 5, TR8, TR 9
(PC -3)	TR 5, TR 7, TR 10, TR 12
(PC -4)	TR 5, TR 7, TR 9, TR 10, TR 12
(PC -5)	TR 8, TR 9, TR 12
(PC -6)	TR 5, TR 6, TR 8
(PC -7)	TR 5, TR 7, TR 10

5 TRAINING MODULE MAP

Module Name	Competencies	Training results
General educational competencies		
Module of socio-political knowledge	EC1,EC3,EC4,EC5	RE1,RE2, RE3,RE4
Multilingual training module	EC2, EC6, EC9,BC3	RE3,RE4
Professional foreign language module	EC8, PC1,PC2,BC7	RE5,RE7,RE9
Security technology module	EC7	RE6
Physical training	EC9	RE6

module		
Module of ecology and scientific activity	EC1, EC7,	RE1, RE2, RE4, RE6, RE10
Basic disciplines		
Math Module	EC4,BC1,BC7	RE1, RE5,RE9
Technical module	EC4, BC1,BC2,BC7,PC1,PC6	RE1,RE5,RE7,RE9
Multilingual training module	EC2,EC6,EC9,BC3	RE3,RE4
Professional foreign module	EC7, PC1,PC2,BC7	RE5,RE7,RE8,RE9
Information Technology Module	EC4, EC8, BC2, BC5, BC7 PC1,PC2,PC3,PC4,PC5,PC6,PC7	RE5,RE6, RE7,RE8,RE9, RE10,RE12
Module of programming	EC8, BC2, BC6,BC7,PC1, PC3,PC4, PC6,PC7	RE5, RE7,RE8,RE9, RE10,RE12
Control module	EC8, BC2,BC4,BC5,BC6,BC7,PC4,PC6,PC7	RE3, RE5,RE6,RE8, RE10, RE11
Security technology module	ES8, BC2, БК7, ПК2, ПК3	RE5, RE6, RE7, RE9
Profiling disciplines		
Information Technology Module	EC4, EC8, BC2, BC5, BC7 PC1,PC2,PC3,PC4,PC5,PC6,PC7	RE5,RE6, RE7,RE8,RE9, RE10,RE12
Professional foreign module	EC7, PC1,PC2,BC7	RE5,RE7,RE8,RE9
Technical module	EC4, BC1,BC2,BC7,PC1,PC6	RE1,RE5,PO7,RE9
Programming module	EC8, BC2, BC6,BC7,PC1, PC3,PC4, PC6,PC7	RE5, RE7,RE8,RE9, RE10,RE12
ATT		
Module of additional education	EC1, BC1, BC3, BC5	RE2, RE4, RE10, RE11

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6 INFORMATION ABOUT THE DISCIPLINES OF THE EDUCATIONAL PROGRAM

№	Discipline name	Brief description of the discipline (50-60 words)	Number of credits	Generated learning outcomes (codes)
Cycle of general education disciplines - 56 credits Mandatory component of OOD -51 credit				
1	History of Kazakhstan	The discipline provides objective historical knowledge about the main stages of the history of Kazakhstan; directs students' attention to the problems of formation and development of independent statehood in Kazakhstan, spiritual culture, continuity and continuity of ethnogenesis; brings to the consciousness of students the essence of fundamental problems of history, teaches them scientific methods of historical knowledge, forms their scientific worldview and civic position. **Active learning methods used:** interactive and digital technologies, project-based teaching methods, problem-based learning technology, gamification.	5	**ON** 1, **ON** 2
2	Foreign language	The discipline is intended to provide training for students in the general education discipline "Foreign Language", as one of the mandatory disciplines that contribute to the formation of intercultural communicative competence at a sufficient level. Students use language material with language tools sufficient for a given level, correct errors in a timely manner and independently, analyze the causes and consequences of events in texts and choose forms and types of speech. *Active learning methods used:* design method, role-playing games, round tables, etc.	10	**ON** 3, **ON** 6
3	Kazakh (Russian) language	The discipline is aimed at developing students' speech skills in mastering additional means of communication in relation to the Kazakh (Russian) language and obtaining professional education. Development of lexical and grammatical skills; improving listening skills; development of information culture, language acquisition. During the learning process, students learn methods and techniques of various text analysis, use a system of subject	10	**ON** 1, **ON** 3

		and language knowledge to solve problems of educational and professional communication. *Used active teaching methods:* case-study, syncwine, pair and group work, discussion.		
4	Module of socio-political knowledge (Psychology, Culturology, Sociology and Political Science)	The discipline "Psychology" forms a holistic understanding of the psychological and personal characteristics of a person, reveals issues such as emotions, emotional intelligence, human will, psychology of self-regulation, individual typological characteristics, values, interests, norms - a spiritual basis. Considers the psychology of the meaning of life, professional self-determination, health, communication between individuals and groups, as well as techniques for effective communication. *Active learning methods used:* discussion, case method, fishbone, cinquain, flipped classroom method, project method.	8	ON 1, ON 2, ON 3
		The discipline "Culturology" reveals the fundamentals of the nature of cultural phenomena and processes, the specifics of the laws of functioning and development of culture; gives an idea of the basic concepts of cultural studies; methods of analysis of specific cultural phenomena, typology of cultures; ethnic and national, elite and mass culture; forms modern knowledge about culture, knowledge in the field of anti-corruption culture and contains concepts relating to criminal offenses and all corruption phenomena. *Used active teaching methods:* problem-based lectures, round table, discussion, presentations.		
		Sociology is the science of social life and social interactions of individuals. Globalization, economic progress, division of labor in society lead to the need to develop entrepreneurship skills. Sociology is a way to understand complex social systems and processes, the problem of preserving society as an integrity. Sociological knowledge allows us to consider any phenomenon in the		

		human dimension, to see its social mechanisms and social consequences. *Used active teaching methods:* problem-based lectures, round table, discussion, presentations.		
		In the modern world, political science is an integration science, including the entire complex of sciences about politics and its relationship with man and society, there is a modernization of public consciousness and the strengthening of the national patriotic idea "Mangilik El. Rukhani zhangyru." Its object is politics as an aspect of the life of modern society. Political science studies the laws of the functioning of politics and its historical development. *Used active teaching methods:* problem-based lectures, round tables, discussions, presentations.		
5	Physical education	The discipline develops knowledge in the field of conditions for maintaining and strengthening human health, the ability to build a personal educational trajectory for self-development, focused on a healthy lifestyle to ensure full-fledged social and professional activity through methods and means of physical culture, including planning activities aimed at maintaining and strengthening health, safety precautions during physical education, organization and conduct of physical education and health activities. Used active teaching methods: situational-problem-based, situation dossier, game learning, heuristic conversations, work in small groups.	8	**ON** 1
6	Philosophy	Philosophy is a special form of knowledge of the world, developing a system of knowledge about the fundamental principles and foundations of human existence, about the most general essential characteristics of human relations to nature, society and spiritual life in all its main manifestations. Philosophy synthesizes and generalizes the results of the practical and spiritual development of the world, offering possible strategies	5	**ON** 1, **ON** 2

		and choices for the sociocultural development of public life. *Used active teaching methods:* problem-based round table lectures, discussion, commented reading of primary sources.		
7	Information and Communication Technologies (in English)	The purpose of studying the discipline is to develop the ability to critically understand the meaning of ICT in digital globalization, to acquire knowledge and skills in using modern ICT in various types of professional and social activities. The result of the training is the ability to apply modern programming languages, systems engineering methodology, ICT technological standards, and an understanding of methods and means of constructing information security systems in professional activities. Used active teaching methods: problem-based lectures, case-study, round table, discussion, presentations.	5	**ON** 5, **ON** 6, **ON** 8
University component / Elective component - 5 credits				
1	Ecology and life safety	The discipline forms knowledge in the field of ecology, determines its role in solving modern economic and political problems, considers the basic ecological concepts and laws of the functioning of natural systems, the tasks of ecology as a science. Management in the field of environmental safety. Legal aspects of nature protection. Ensuring the protection of the population from the consequences of accidents, catastrophes, natural disasters; carrying out rescue and other urgent work in the affected areas. Used active teaching methods: lecture press conference; method "515"; "Case study"; the "Chain" method, etc.	5	**ON** 1, **ON6**, **ON** 10
2	Methods of scientific research	The discipline allows you to gain knowledge on the basic theoretical provisions, technologies, operations, practical methods and techniques of conducting scientific research on the basis of modern achievements of domestic and foreign scientists and to master the skills of choosing the topic of scientific research, scientific search,		**ON** 2, **ON** 4, **ON** 10

		analysis, experimentation, data processing, obtaining sound effective solutions using. Information technology. Used active teaching methods: problem lectures; brainstorming; round tables; game exercise.		
Cycle of basic disciplines-112 credits **University component -54 credits**				
1	Discrete Mathematics	The discipline forms knowledge in the use of basic mathematical models and algorithms that allow you to professionally formulate and solve many problems in specific areas of computer science. The following are considered: the concept of a set, operations on sets; relations, binary relations, properties of binary relations, operations on binary relations; Boolean functions, laws of Boolean algebra, disjunctive and conjunctive normal forms; fundamentals of propositional logic and predicate logic; the concept of a graph, etc. Used active teaching methods: lecture visualization; case study; contextual learning; learning based on experience.	4	**ON 4, ON9, ON12**
2	Mathematics1	The discipline is the foundation of mathematical education of a specialist, contributes to the development of mathematical intuition, the education of mathematical culture, within the framework of this course, the basic concepts of linear and vector algebra, analytical geometry, mathematical analysis of the function of one variable are formed, simple mathematical models of specific tasks are studied; orientation is carried out on the implementation of logical analysis of specific tasks, on the application of mathematical methods in professional activity, to create mathematical models of simple professional tasks. Used active teaching methods: lecture visualization; case study; contextual learning.	4	**ON 4, ON6**
3	Physics	The discipline is based on the attitude to the formation of students' system of basic concepts of physics and ideas about the modern physical picture of the	5	**ON 4, ON12**

		world, as well as the development of skills to apply physical knowledge both in professional activities and to solve life problems. Having a logical harmony and relying on experimental facts, the discipline forms a truly scientific worldview among students. The active teaching methods used are: lecture visualization; case study; contextual learning; experience-based learning.		
4	Algorithms, data structures and programming	The discipline forms a systematic and holistic view of the theory of the development of algorithms, methods and technologies for solving practical and scientific problems in the Python programming language. The following are considered: the concept of an algorithm; basic algorithmic structures; Python operators; mutable and immutable data types, simple and structural data types and operations on them; functions, recursive functions and principles of their development; algorithms for sorting and searching data, greedy algorithms, etc. *Used active teaching methods:* problem lectures; problem-business games; case study; the decision tree method.	4	**ON 5, ON 7, ON 9, ON 12**
5	Professionally oriented foreign language	Professionally-oriented foreign language (English) provides training to speak and write in a foreign language, forms a set of knowledge, skills and abilities in the field of using the basics of project management in accordance with international standards, the specifics of project management. The program provides an introduction to the subject area of a specialty in a professional foreign language, as a disciplinary phenomenon serving all spheres of human activity. *The active teaching methods used* are the design method, role-playing games, case-study, cinquain, pair and group forms of work.	5	**ON1,ON2,ON3**

6	Mathematics 2	The discipline forms the fundamental concepts of differentiation and integration in solving mathematical problems; teaches to analyze numerical data presented in the form of diagrams, graphs, analyze statistical information; work with scientific literature, with information and reference material. Used active teaching methods: lecture visualization; case study; contextual learning.	5	ON 4, ON6, ON 12
7	Basics of information systems	The discipline forms a complex of interrelated knowledge in the field of theoretical and methodological foundations of information systems, the laws of their functioning and development; the basic provisions of information theory, measurement; the basic concepts of data compression, information transmission over a communication channel, finding the most economical coding methods that allow transmitting a given information using a minimum number of characters, determining the amount of storage devices intended for for storing information. Used active teaching methods: lecture discussion; contextual learning; educational discussion; analysis of a specific situation.	5	ON 6, ON 8,ON10, ON 12
8	IT infrastructure	The discipline examines issues related to the concept of infrastructure, its role in IP and in OT. The place of information infrastructure management in the general structure of enterprise management is determined. Introduces ITIL and ITSM methodologies. Considers methods and means of information infrastructure management. Describes the business architecture and IT architecture of the organization, the methodological foundations of enterprise IT infrastructure management, modern standards in the field of information technology service management (ITIL, COBIT). Used active teaching methods: lecture with analysis of micro-situations; case-study; solving practical problem problems.	4	ON 6, ON 7, ON8,ON12

9	Object Oriented Programming	The discipline forms knowledge in application development using modern technologies of the Java development environment (IntelliJ IDEA, NetBeans, Eclipse, Android Studio), various tools, solving specific mobile tasks: refactoring, assembly, templating, finding the causes of low performance and its increase, also the difference between the methodology of procedural programming from object programming, the stages of program development, features of object-oriented programming, graphical capabilities of Embarcadero RAD Studio XE8. The active teaching methods used are: problem lectures; problem-business games; case study; the decision tree method.	5	**ON5, ON6, ON7, ON12**
10	Mobile Application Development	The discipline forms a systematic and holistic view of the development of mobile applications: starting with the business analysis of requirements for a mobile application, continuing with the use of modern approaches and tools for team development and the use of version control systems, ending with testing and quality control of the developed mobile application (including DevOps techniques). Used active teaching methods: teamwork on projects; solving practical problem problems; situation-exercise.	5	**ON 9, ON 11, ON 12**
11	3D modeling systems	The discipline characterizes the ability to consider the final product at the initial stage of its construction using 3D modeling. Thanks to special programs, it is possible to recreate the design model in real time with minimal time and money. The use of computer visualization is suitable not only for large projects, but also for the design of small objects. The active teaching methods used are: lecture-visualization; situation-problem; case-study.	4	**ON 4, ON 10, ON12**
12	Educational practice	Educational practice is a necessary component of the educational process for training specialists in the specialty	1	**ON 1, ON 6**

		"Information Systems". During the training practice, the skills of working on a personal computer, using the capabilities of application software packages, special literature, searching for necessary information on the Internet, developing algorithms for solving problems, writing and debugging programs in Python, preparing and processing technical documentation are consolidated. Used active teaching methods: solving practical problem problems; situation-exercise.		
13	The practical training	The students' industrial practice is aimed at the stages of facilitating the training of qualified specialists, the purpose of which is to consolidate in practice the theoretical knowledge acquired by students in the learning process, as well as to deepen and develop practical work skills at enterprises, taking into account the peculiarities of the development and implementation of information technologies and information systems. The active teaching methods used are: analysis of a specific situation; situation-exercise; solving practical problem problems.	3	**ON 5, ON 7**
Optional Component - 58 Credits				
2	Theory of electrical circuits.	The discipline is aimed at studying the theoretical and methodological foundations and experience in using the laws of electrical and magnetic circuits, the physical foundations of the theory of electrical and magnetic circuits, elements of linear electrical circuits, nonlinear elements of electrical circuits, basic concepts of the structure of an electrical circuit, analysis of complex DC electrical circuits. The discipline reveals the basic laws, properties and characteristics of electrical circuits. Introduces students to methods for analyzing electrical circuits in steady-state and transient conditions. Active teaching methods used: problem situations; learning through play; method of heuristic questions;	4	**ON 4,ON9 ON 12**

		game design, etc.		
	Theoretical foundations of electrical engineering	The discipline is aimed at studying the theoretical and methodological foundations and experience of using linear electrical circuits, sinusoidal current, the principles of operation of the simplest sinusoidal emf generator, Ohm's and Kirchhoff's laws for sinusoidal current circuits, three-phase electrical circuits, principles of operation of a three-phase emf generator. d.s., devices and principles of operation of DC machines, electromechanical analog devices, physical foundations of semiconductor devices. Active teaching methods used: problem situations; learning through play; method of heuristic questions; game design, etc.	4	**ON 4,ON**9 **ON 12**
3	Basics of Electronics	The discipline forms knowledge about the purpose and fields of application, physical principles of operation, basic technical parameters of semiconductor devices and microelectronic technology; practical skills of analysis, calculation and experimental research, reading and comprehension of ready-made circuit solutions, selection of semiconductor devices, blocks, components and integrated circuits in the development of simple electronics devices. Situational tasks are considered in the classroom, the student develops a technical solution to a real problem. Used active teaching methods: Used active teaching methods: lecture-visualization; situation-problem; case-study.	4	**ON 4, ON 12**
4	Numerical Methods	The discipline forms knowledge in the field of theory and methodology of using basic problems and algorithms of computational mathematics, solving linear algebra problems; solving nonlinear equations and systems; interpolation of functions; numerical integration and differentiation; solutions of differential equations; methods of approximation and approximation of functions. The discipline is aimed at applying mathematical		**ON 4, ON 6, ON 8**

		methods in professional activities, solving simple professional tasks related to the road industry. Used active teaching methods: lecture visualization; case study; contextual learning.		
5	Digital road infrastructure management *	The discipline forms knowledge of the world experience in the development of intelligent transport systems, about the main elements of intelligent transport logistics systems, traffic management, operation and maintenance of road infrastructure and road safety; forms practical skills in the development and use of hardware and software for the implementation of digital management of road infrastructure. Used active teaching methods: team projects (brainstorming, presentation and discussion).	4	**ON 3, ON8, ON11**
6	Digital logistics *	The discipline forms knowledge about the specifics of the transition to digital logistics, introduces modern solutions of Logistics 4.0 and Smart Supply chains, the Internet of Things, solutions to the problems of hybrid supply chains, robots and cobots in logistics; forms practical skills in the application and development of solutions for the use of hardware and software for the implementation of digital logistics. Used active teaching methods: team projects (brainstorming, presentation and discussion).		**ON 3, ON8, ON11**
7	IT-Project Management	The discipline forms a complex of knowledge, skills and abilities for project management in accordance with international standards and PMI PMBOK guidelines; modern practices in project management, including several varieties of flexible management methodologies (AGILE, KANBAN, SCRUM, LEAN, etc.); specifics of project management in the field of information technology, the use of various software products when managing projects. Used active teaching methods: team projects (brainstorming, presentation and discussion); solving practical problem problems.	4	**ON 3, ON 5, ON 6**

| 8 | Information systems in business and management | The discipline forms knowledge about the practical application of information systems in the enterprise. The impact of information technologies on competition, the market; the main trends in the application of information systems, the impact of OT on the economic potential of the enterprise. An understanding is being formed of how to support the processes of creation, management, modernization and promotion of information resources (IR) of the organization, how to develop the structure and services of the IR of the organization. Used active teaching methods: problem situations; "Brainstorming"; "Round table"; discussion; project method, etc. | | **ON8**, ON11 |
| 9 | Creating a startup** | The discipline is aimed at studying modern approaches to the development of new ideas in the form of a startup, starting with the formation of a business plan, further step-by-step verification of each of the hypotheses of the initial business plan and reversal, if necessary (identification of consumers), ending with the verification of consumers for a startup. During the course, all knowledge and skills are given in the form of theory, with consolidation in practice in team projects. Used active teaching methods: problem lecture; case-study; basket method; discussion, presentations. | 4 | **ON 8, ON 10, ON 11** |

10	Automation of business documentation **	The discipline helps to understand the need to implement electronic document management systems in the business processes of any organization, gain experience in assessing the capabilities and complexity of the selected system. Introduces the principles of automated document management systems. The theoretical foundations of electronic document management technologies and the practice of their application in the IP of enterprises for the purpose of documentation management are considered. The use of technologies for the collection, management, storage, protection and delivery of information related to organizational processes. Used active teaching methods: problem lectures, round table, discussion, presentations.		ON8, ON10, ON11
11	Digital interfaces of data transmission **	The discipline forms a complex of knowledge, skills and abilities in the field of using digital data transfer interfaces, discusses the main functions of digital input/output interfaces, structures, exchange channels, technical and operational characteristics of the main, most common digital interfaces of information and computing systems Used active teaching methods: problem situations; "Brainstorming"; discussion, method projects.		ON5, ON11, ON12
12	Metrology, standardization and quality management	The discipline forms students' complex of knowledge related to measurements, methods and means of ensuring their unity and ways to achieve the required accuracy, the essence of technical standardization, conformity assessment, standardization and certification. Improves practical skills in the use of various measuring instruments and high-precision instruments, the ability to assess the compliance of technical products with the requirements of compliance and quality standards based on knowledge of international and national systems of relevant regulatory documents. Used active teaching methods: problem lecture; case-study; discussion, presentations, etc.		ON4, ON6, ON10

13	Methods, models in the management of the road industry	The discipline forms knowledge about modern methods of constructing mathematical models of technical systems, about transport modeling, the current state of transport system theories, various tools and simulation packages for modeling traffic flows; practical skills in using specialized software for transport modeling, research and creation of predictive transport models. Used active teaching methods: individual projects (computer modeling, presentation and discussion).	5	ON 3, ON 4, ON 11
14	Business process modeling	The discipline forms knowledge of methods of analysis and modeling of business processes, principles of construction and architecture of computing systems, types of content of information resources of the enterprise, processes of digital content management, processes of creation and use of information services; practical skills of modeling, analysis and improvement of business processes, IT project planning, selection of rational IS for business and content management enterprises. Used active teaching methods: individual projects (computer modeling, presentation and discussion).		ON 4, ON 11
15	Modern operating systems	The discipline forms a complex of knowledge, skills and abilities in the field of operating systems application, considers: memory management, file systems, input and output of information, deadlocks, virtualization and cloud, multiprocessor systems, security, operating system architecture and application programming interfaces; design of parallel interacting computing processes, the problem of deadlocks and methods to combat them, installation and configuration of modern programs for various virtual machines. Used active teaching methods: solving practical problem problems; presentations; discussions.	5	ON 6, ON 7, ON 9
16	Business process automation	The discipline is aimed at studying and building business process models using modern automated systems using tools, modeling methods, drafting technical specifications, process management lifecycle, modern		ON 7, ON 9, ON 11

		languages and modeling environments for enterprise architecture, corporate information management systems (CIUS), virtualization of business processes based on the creation of virtual enterprises, standards in the field of business process modeling – the IDEF family. Used active teaching methods: solving practical problem problems; presentations; discussions.		
17	Introduction to the Internet of Things **	The discipline forms knowledge about the basic principles of organization and functioning, the history of origin and development, the main factors of the development of the Internet of Things, existing technologies, trends and prospects in the field of the Internet of Things; practical skills of working with Arduino microcontrollers, connecting and programming end devices, creating a software solution for creating and storing data using cloud technologies. In practical classes, team projects are carried out (brainstorming, presentation and discussion). Used active teaching methods: lecture-discussion; intellectual warm-up; solving practical problem problems; business games.	5	**ON 6, ON8, ON12**
18	Certification and technical documentation	The discipline forms students' knowledge in the field of certification of software and systems, as well as in technical documentation, the application of the requirements of regulatory documents to the main types of services and processes, national and international standardization and certification systems, standards for paperwork, regulations, protocols and the organization of their own activities, the choice of standard methods and methods of performing professional tasks, evaluation their effectiveness and quality. Used active teaching methods: lecture-conversation; solving practical problem problems; situation-problem; presentation.		**ON6, ON11**
19	Computer games programming	The discipline forms a complex of knowledge, skills and abilities in the field of computer game development implemented in the Python programming language	5	**ON 5, ON 9,ON12**

		using the PyGame framework and the tkinter library. The following are considered: application development stages with GUI; tkinter event processing; creation of classes in Python; game template; graphics in PyGame; event processing in PyGame; PyGame classes; animation and sprites; collision recognition; game sound design; organization of work in a computer game development project. Used active teaching methods: group mini-projects; brainstorming.		
20	Digital media technology	The discipline forms a complex of knowledge in the field of the use of digital media technologies, analysis and visualization of information on specific examples developed in the Python programming language. The following are considered: application development stages with GUI; widgets, tkinter event processing; creation of classes and objects in Python; NumPy array processing; Matplotlib basics, drawing structure in Matplotlib, plotting in Matplotlib, special drawing elements in Matplotlib; Pygal library, design of Pygal graph elements. Used active teaching methods: group mini-projects; brainstorming.		**ON** 5, **ON11, ON 12**
21	Architecture of computer systems and networks	The discipline forms knowledge in the field of architectural features of modern computers and computer systems, the composition and purpose of computer system elements, classification of computers, main computer devices and their purpose, classification of networks, network architecture, their standards and network equipment. Studies the basics of the theory of logical design of digital devices, elements and functional components of computers, as well as the arithmetic basics of computers. Used active teaching methods: analysis of a specific situation; discussion; project method.	5	**ON** 5, **ON** 11, **ON 12**
22	Multiprocessor computing systems (OLTP, DM, DW, DSS)	The discipline forms knowledge on the use of computer systems based on applied technologies when working with information resources that are used in the business processes of the		**ON** 7, **ON 9,ON12**

		organization. The directions of using OT for specific applications in solving professional tasks are determined. The use of multiprocessor computing systems involves the practical development of the following sections of parallel processing in computing machines: architectural principles of parallel processing implementation in a VM, as well as in the section of parallel computing methods. Used active teaching methods: analysis of a specific situation; discussion; project method.			
23	Information security and information protection	The discipline is aimed at studying the theoretical and methodological foundations and experience of using information security, levels and models of information security, building and evaluating a security system based on the ISO/IEC 15408 standard, the basics of cryptography, information security administration, the use of basic software and technical measures to ensure a high degree of protection of access to information, insider attacks, the use of software code defects, malware, electronic signature of binary programs. Used active teaching methods: analysis of a specific situation; discussion; project method.	5		**ON 5, ON**12
24	Security and protection of economic data	The discipline studies the basic concepts and definitions of information security, legal foundations of information security, information risk management, cryptographic methods of information protection, technical means of information protection, hardware and software means of information protection, means of information protection in economic information systems, steganographic technologies and methods of information protection, personal computer data protection, anti-virus protection of information, general an approach to ensuring the security of economic information systems. Used active teaching methods: case-study;			**ON5, ON11, ON12**

		brainstorming; individual projects		
25	Systems of automation of activity of the enterprise (1C: Enterprise)	The discipline is focused on the study and application of modern means of automation of the organization's activities in professional activity, the fundamental concepts and methods of automation of managerial work are considered, the analysis of IT tools is carried out. The principles of building information systems and the criteria for their selection for an enterprise based on the 1C:enterprise platform are analyzed. Used active teaching methods: classes with elements of conversation and the use of multimedia tools; case-study; work in small groups; discussion.	5	**ON 5, ON 7, ON 11, ON 12**
26	ERP and business opportunity management. (ERP "Galaxy")	The discipline forms a complex of knowledge, skills and abilities in the field of using ERP systems, which are based on the principle of creating a single data warehouse containing all corporate business information and taking into account information, material, financial, economic and production processes in the company. Will give an overview of ERP business solutions, lay the basic knowledge of ERP systems. Used active teaching methods: classes with elements of conversation and the use of multimedia tools; case-study; work in small groups; discussion.		**ON 8, ON 11, ON12**
27	Digital marketing by industry	The discipline forms a set of theoretical knowledge and practical skills in the field of using digital technologies in marketing, considers the issues of marketing and promotion of your project, company or personal brand in social networks (SMM marketing) and the basic principles of content contagiousness (promotion through word of mouth); website design and management taking into account the principles of optimization SEO and SMO, the use of email marketing for promotion. Used active teaching methods: lectures-conversations; use of multimedia tools; case-study; work in small groups;	5	**ON 5, ON 8, ON 11**

		discussion.		
28	Digital management by industry	The discipline forms a complex of knowledge, skills and abilities in the field of using digital tools and data in company management from corporations to medium and small businesses: data accounting in digital format, features of software for financial accounting and planning, production management, personnel management, customer relationship management, business analytics and integrated management by examples real business cases. Used active teaching methods: lecture - "brainstorming"; use of multimedia tools; case-study; work in small groups; discussion.		**ON 5, ON 8, ON 11**
	* *Major*		4	**ON 5, ON 8, ON 11**
	**Minor*			
Cycle of profiling disciplines - 60 credits University component - 46 credits				
1	Programming technology	The discipline is aimed at studying the theoretical and methodological foundations and programming techniques that are used at all major stages of the program life cycle. We study: C++ data types, program structure, instructions, C++ control structures, library, user, recursive functions in C++, classes, data abstraction and OOP in C++; as well as issues related to the design of algorithms, the use of structural and modular programming methods in C++. Used active teaching methods: solving practical problem problems; case-study; working in small groups; discussion.	6	**ON 5, ON 9, ON 12**
2	Databases in IS	The discipline forms a complex of knowledge, skills and abilities in the field of database theory, research and use of various data representation models, language tools for data representation and processing in databases, as well as the development of information applications based on databases in a DBMS environment using various programming languages. Contributes to the formation of knowledge and skills in the field	5	**ON 7, ON 11, ON 12**

		of database theory, research and use of various data representation models. Used active teaching methods: lecture-discussion; solving practical problem problems; method-projects; presentation.		
3	Robotics	The discipline is aimed at mastering the theoretical foundations of the functioning and design of industrial and household robotic systems; considers methods of creating robotic systems and their programming in special development environments; types of sensors, actuators and other elements necessary for the creation of robotic systems; characteristics of robots and robotic tools. All knowledge and skills are consolidated within the framework of teamwork on projects. Used active teaching methods: lecture-discussion; solving practical problem problems; method-projects; presentation.	5	**ON 4, ON 9, ON 12**
4	Client server applications	The discipline is aimed at studying the basic concepts of client-server applications: architecture, types of interaction, IP addresses, sockets and ports. The discipline forms an idea of the development of client-server applications: starting with the business analysis of requirements, continuing with the use of modern approaches for team development and version control systems, ending with testing and quality control of the developed application (including using DevOps techniques). Used active teaching methods: lecture-discussion; solving practical problem problems; method-projects; presentation.	4	**ON 6, ON 8, ON 9, ON 12**
5	Web technologies	The discipline is focused on the study and application in professional activity of concepts and practical techniques of the organization and functioning of the Internet, teaching methods of designing applications for use in the Internet environment. Studies the basics of web design, graphic programs; common web browsers, HTML, CSS,	5	**ON 5, ON 8, ON 12**

		JavaScript, technologies for creating and editing Internet advertising objects (banners, buttons, flash objects); basics of web design; technology for creating hypertext documents. Used active teaching methods: lecture-discussion; solving practical problem problems; method-projects; presentation.		
6	Intelligent information systems and knowledge bases	The discipline is aimed at studying the theoretical foundations of the functioning of two types of intelligent systems: biological or ascending and semiotic or descending. Neural networks, genetic algorithms and other bio-inspired systems are considered as intelligent systems of the first type. Expert systems are considered as systems of the second type. The main practical task of the course is to select and configure a database and/or knowledge for such systems. Used active teaching methods: lecture-discussion; solving practical problem problems; method-projects; presentation.	5	**ON 8, ON 8, ON** 12
7	Industrial practice 3k	The practical training of students is an important part of the training of highly qualified specialists. It is aimed at consolidating and expanding theoretical knowledge and practical skills in the field of design, operation and maintenance of software and hardware for data processing; in the use of innovative IT technologies; in the development of methods and means of research in the subject area of industrial, economic and other purposes. Used active teaching methods: solving practical problem problems; group work.	5	**ON 3, ON 6, ON 8**

8	Undergraduate practice 4k	The pre-graduate practice is aimed at consolidating theoretical and practical knowledge obtained at the university in the field of application of: modern methods of system analysis of information processes; the use of information technologies in the development of CIS; the use of IP modeling tools; information security; software development, the use of network technologies, database management tools and knowledge, computer graphics tools; the acquisition of experience in the study of a scientific problem. Used active teaching methods: solving practical problem problems; group work.	12	**ON** 3, **ON** 5, **ON** 6, **ON** 7, **ON** 8, **ON** 9, **ON10, ON** 12
Optional Component - 14 Credits				
1	Designing of IS in the auto- road industry	The discipline forms a complex of knowledge, skills and abilities in the field of IP design for the road industry based on the UML language and the principle of "Clean Architecture", including the analysis of business requirements for the designed IP, the use of flexible software development management methods (including DevOps techniques) and teamwork, the selection of software tools and hardware software, testing, implementation and maintenance of IP. Used active teaching methods: solving practical problem problems; group work; discussion; presentation.	5	ON6, ON9, ON12
2	The software design of the EIS	The discipline forms a complex of knowledge, skills and abilities in the field of IP design for economic and business tasks based on the UML language and the principle of "Pure architecture", including the analysis of business requirements for the designed IP, the use of flexible software development management methods (including DevOps techniques) and teamwork, the selection of software tools and hardware, testing, implementation and maintenance of IP. Used active teaching methods: solving practical problem problems; case-study; working in small groups;		ON5, ON5, ON9, ON12

		discussion.		
3	Programming C#	The discipline is focused on teaching students the knowledge, skills and abilities of the C# language. The topics studied are based on the use of modern information technologies, the latest computer software and hardware. C# is a modern object-oriented and type-safe programming language. C# allows you to create different types of secure and reliable applications running in .NET. Used active teaching methods: solving practical problem problems; case-study; working in small groups; discussion.	5	**ON5, ON 6, ON 9, ON 11, ON 12**
4	Python Packages	The discipline is aimed at developing competencies in the field of software development in Python, using additional features provided by its packages; be able to: create your own classes and apply standard Python package classes to solve practical problems; develop a modern user interface for Python programs, use the graphical capabilities of Python; possess: the skills of using the Python programming language for the development of application programs for various purposes, the use of exception handlers, visualization and data analysis. *Used active teaching methods:* case-study, brainstorming, individual projects.		**ON 5, ON 6, ON 9, ON 12**
5	Telematics in the road industry	The discipline forms knowledge about the principles of operation and technical and operational characteristics of the main devices of telematics systems, methods and technologies of automated regulation of traffic flow, telematics intelligent systems; practical skills in analyzing the technical condition and technological processes of transport, the choice of telematics equipment, the use of software, information technology. Used active teaching methods: situational tasks modeling telematics in transport; discussions; presentations.	5	**ON5, ON6, ON9, ON12**

6	BigData technologies and cloud computing	The discipline forms theoretical knowledge of the main characteristics of "cloud" technologies. During the training, students get acquainted with the method of studying large arrays of data containing disparate information, Gain the skills to extract the necessary information from various sources. Students should know the methodology of research, data collection, data processing and transformation, model building, and ways to organize data storage. During the course of studying the discipline, students will gain skills in working with tools for organizing data storage, skills in software implementation in programming languages; application development for existing "cloud platforms", etc. Used active teaching methods: situational tasks; solving practical problem problems; discussions; presentations.		**ON 7, ON 8, ON 12**
Final state certification				
7	Final certification	Writing and defending a thesis (project) or preparing and passing a comprehensive exam The main tasks of performing and defending a thesis are: collection, processing and generalization of practical material on the topic of the thesis, analysis of data and practical material in the field of implementation and use of information systems and technologies within the framework of the topic of pre-graduate research, formulation of conclusions, patterns, recommendations and suggestions on the topic of the thesis.	8	**ON 5, ON 8, ON 9, ON10,ON 11, ON 12**
TOTAL			**240**	
Additional types of education (ATE) - 7				
1	Academic writing	The discipline is devoted to the formation of students' skills in writing academic texts, such as an abstract, essay, annotation, project, article, literature review, etc., skills in creating and editing reports and presentations, and skills in correctly compiling a bibliographic description, taking into account the requirements for academic papers *Used active teaching methods:*	3	**ON1, ON4, ON6,**

		solving practical problem problems; working in small groups; discussion.		
2	Financial literacy	Financial literacy is the skills to manage income and expenses, as well as the competent distribution of personal finances. The course "Financial Literacy" examines the sources of financial income of the population, their distribution, the possibility of profitable placement of temporarily free funds of individuals for the purpose of saving and accumulating them, mandatory and voluntary life insurance, taxation of income and property of individuals, the pension system of the Republic of Kazakhstan, contributions to the mandatory pension fund, pension annuity, methods and techniques of attracting additional financial resources in order to invest them in the economy of Kazakhstan.	3	ON10, ON11