MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

Kazakh Automobile and Highway Academy named after LB Goncharova

Road Faculty

"APPROVED"
Chairman of the Academic Council
The rector of KazARI after L..B.Goncharov
doctor of technical sciences, professor
_____ R. Kabashev
"__28__" __march__ 2023

CATALOG OF ELECTIVE DISCIPLINES

for the 2023-2027 school years

Education field code and Classification: 6B06 - Information and Communication Technology

Code and classification of training areas: 6B061 – Information and Communication Technology

Educational program:	6B06106 Information systems Undergraduate
Educational programs group	B057 Information technologies

Awarded degree: Bachelor in Information and Communication Technology for the educational program 6B06106-Information Systems

Almaty 2023

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH AUTOMOBILE ROAD INSTITUTE named after L.B. GONCHAROV

List of elective specialty disciplines
6B06106 Information systems

№	Name of the discipline	Credits	Cycle of disciplines	Recommended semester	Note
Cycle of general education disciplines GED Component of choice CC					
1.	Ecology and life safety	5	GED CC	4	Appendix № 1, p. 4.
2.	Methods of scientific research				Appendix № 2, p. 5.
Cycle of Basic Disciplines (BD)					
Component of choice CC					
3.	Theory of electrical circuits	4	BD (CC)	3	Appendix №3, p. 6.
4.	Theoretical foundations of electrical engineering				Appendix №4, p. 7.
5.	Basics of Electronics	4	BD (CC)	3	Appendix №5, p. 8.
6.	Numerical methods				Appendix №6, p. 9.
7.	Digital road infrastructure management	4	BD (CC)	4	Appendix №7, p.10.
8.	Digital logistics				Appendix № 8,p.11
9.	IT project management	4	BD (CC)	5	Appendix №9, p. 12.
10.	Information systems in business and management*				Appendix №10, p. 13.
11.	Creating startup	4	BD (CC)	5	Appendix №11, p. 14.
12.	Automation of business documentation**				Appendix №12, p. 15.
13.	Digital data interfaces transfer**				Appendix №13,p.16
14.	Digital road infrastructure and quality management				Appendix №14,p.17
15.	Methods, models in the management of the road industry	5	BD (CC)	6	Appendix №15, p. 18.
16.	Business process modeling				Appendix №16, p. 19.
17.	Modern operating systems	5	BD (CC)	6	Appendix №17, p. 20.
18.	Business Process Automation				Appendix №18, p. 21.
19.	Introduction to the Internet of Things	5	BD (CC)	6	Appendix №19, p. 22.
20.	Certification and technical documentation				Appendix № 20, p. 23.
21.	Computer games programming	5	BD (CC)	6	Appendix №21, p. 24.
22.	Digital media technology				Appendix №22, p. 25.
23.	Architecture of computer systems and networks	5	BD (CC)	7	Appendix №23, p. 26.
24.	Multiprocessor computing systems (OLTP,DM,DW,DSS)				Appendix №24, p. 27.

25.	Information security and information protection	5	BD (CC)	7	Appendix №25, p. 28.
26.	Security and protection of economic data				Appendix №26, p. 29.
27.	Systems of automation of activity of the enterprise (1C: Enterprise)	4	BD (CC)	7	Appendix №27, p. 30.
28.	ERP and business opportunity management. (ERP "Galaxy")				Appendix №28, p. 31.
29.	Digital marketing by industry	4	SD(CC)	7	Appendix №29, p. 32.
30.	Digital management by industry				Appendix №30, p. 33.
The cycle of the specialized disciplines (SD)					
Component of choice CC					
31.	Designing of IS in the auto- road industry	5	SD(CC)	7	Appendix №31, p 34.
32.	The software design of the EIS				Appendix №32, p. 35.
33.	Programming C#	5	SD(CC)	7	Appendix №33, p. 36.
34.	Python Packages				Appendix №34, p. 37.
35.	Telematics in the road industry	4	SD(CC)	7	Appendix №35, p. 38.
36.	BigData Technologies and Cloud Computing				Appendix №36, p. 39.

Note: A brief description of the elective specialty disciplines is given in the Appendix.

Agreed:
General Director of Honeywell-ASU LLP, S.K. Abdigaliyev
Director of GIS ALI LLP Umurzakov R.D.
The coordination acts are attached.

Catalog of elective disciplines in EP 6B06106 - Information Systems considered and discussed at the meeting of the Department Protocol number 9 from March 14, 2023

Head Department of HK, GD and IP Ph.D., associate professor _____ G.D.Estemessova

The catalog of elective disciplines is recommended by SMC Protocol No. 9 of March 21, 2023.

Chairman of the SMC, Ph.D., professor _____ U.A. Murzakhmetova

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN
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Brief description of the elective disciplines of the specialty "Information Systems"

Application 1

1	The name of the discipline	**Ecology and life safety**
1	Code of disciplines	E LS 21(2)01
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	2,4
5	Prerequisites	Biology, Chemistry, Life Safety High School Course
6	Post requisites	Production and pre-graduate practice
7	Purpose of study	The main objective of the course is to green the consciousness of students and foster a sense of responsibility for the environment. Knowledge of the basic laws of interaction of the components of the biosphere and the consequences of the intervention of human economic activity, especially in conditions of intensified environmental management, is necessary for solving practical problems in the plane of the relationship between society and the biosphere as a whole.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: the main natural and man-made hazards, their properties and characteristics; the nature of the impact of harmful and dangerous factors on humans and the environment, methods and methods of protection against them; theoretical foundations of life safety in emergency situations; the possible consequences of accidents, disasters, natural disasters; legal, regulatory, technical and organizational foundations for life safety; the anatomical and physiological consequences of human exposure to traumatic, harmful and damaging factors and first aid techniques; methods to protect the public in emergencies. **To be able to:** analyze the flow of environmental processes associated with anthropogenic effects on the environment; identify their causes and solutions; identify the main hazards of the human environment, assess the risk of their implementation; make decisions on appropriate actions in an emergency; recognize life disorders in emergency conditions and injuries; make decisions on appropriate actions in an emergency; choose methods of protection against harmful and dangerous factors of an emergency; to ensure the safety of life in the implementation of professional activities and environmental protection; provide first aid to victims. **Have skills**: the use of personal protective equipment in emergencies; possession of the main methods of protecting production personnel and the public in the event of an emergency; applying knowledge of the functioning of ecological systems and the biosphere as a whole **Competences**: demonstrate the basics of legal knowledge in various areas of life, formulate the basic laws of the functioning of the biosphere and the principles of environmental management to reduce the impact on human health and the environment, apply methods of protection and first aid in emergency situations, demonstrate basic knowledge of mathematics and natural Sciences, their use in professional activities, to build work in a team, tolerantly perceive social general, ethnic, confessional and cultural differences.

Application 2

2	The name of the discipline	**Methods of scientific research**
1	Code of discipline	MSR 21(2)01
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	2,4
5	Prerequisites	The discipline "Scientific Research Methods" involves the use of knowledge gained from studying the disciplines "Information and Communication Technologies (in English)", "Programming Technology", "Algorithms, Data Structure and Programming", "Academic Writing"
6	Post requisites	The student must carry out research work on: writing abstracts; completing coursework; writing and designing a thesis.
7	Purpose of study	The purpose of the discipline is to form in students the fundamentals of organizing and conducting scientific research that meets modern requirements for training qualified specialists.
8	Summary of disciplines	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, analysis, experimentation, data processing, obtaining sound effective solutions using. Information technology. Used active teaching methods: problem lectures; brainstorming; round tables; game exercise.
9	Expected results	Characteristics of the levels of development of competencies in a student. **Know:** global problems of our time and the need for their scientific knowledge; understand the theoretical and methodological foundations (principles, methods, etc.) of organizing and conducting scientific research; know the methodology and methods of scientific research **To be able to:** carry out experimental research and experimental work, starting from identifying problems, choosing a topic, clarifying the methodological apparatus to approbation and literary design of the work; **Competencies:** skills in organizing and conducting scientific research; independent work with scientific literature, development of one's research abilities; selection of appropriate and effective research methods for solving practical problems in the field of information systems.

Application 3

3	**The name of the discipline**	**Theory of electrical circuits**
1	Code of discipline	TEC 22(2)12
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,3
5	Prerequisites	Math 1, Physics
6	Post requisites	Robotics
7	Purpose of study	Theoretical and practical training of bachelors in research and analysis of electrical circuits, the study of electromagnetic phenomena that transmit, distribute, process and generate information, knowledge of which is necessary to solve problems of a future specialty
8	Summary of disciplines	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; game design, etc.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: the fundamentals of the theory, methods and means of theoretical and experimental research of linear and non-linear (in the modes of direct current and harmonic oscillations) electrical circuits with harmonic and non-harmonic influences; fundamentals of the theory of quadrupoles and circuits with distributed parameters, the stability of electrical circuits with feedback, electrical analog filters. **To be able to:** calculate and measure the parameters and characteristics of linear and nonlinear (in the modes of direct current and harmonic oscillations) of electrical circuits; calculate and analyze the parameters of electrical circuits and filters on personal computers. **Have skills**: experimental and theoretical study of electrical circuits in the framework of physical and mathematical modeling of processes in electrical circuits. **Competences:** to understand the surrounding reality on the basis of ideological positions, to demonstrate the basics of legal knowledge in various spheres of life; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in their professional activities; to realize the need to form new competencies to solve practical problems in the field of information systems and technologies.

Application 4

4	**The name of the discipline**	**Theoretical foundations of electrical engineering**
1	Code of Discipline	TFEE 22(2)12
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,3
5	Prerequisites	Math 1, Physics
6	Post requisites	Robotics.
7	Purpose of study	Theoretical and practical training of bachelors in research and analysis of electrical circuits, the study of electromagnetic phenomena that transmit, distribute, process and form information, the knowledge of which is necessary to solve the problems of the future specialty
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: the basics of the theory of electrical circuits of constant, alternating and three-phase currents; device and principle of operation of the transformer and electric machines; principle of operation, device, metrological and operational characteristics of electrical measuring instruments, basic methods of electrical measurements; elementary base of modern electronic devices, characteristics and parameters of semiconductor devices, general rules for the operation of semiconductor devices. **To be able to:** apply the basic laws and ratios of electrical circuits of constant, alternating and three-phase currents for their analysis and calculation; read electrical circuits and understand the purpose of the basic units of electrical equipment; measure basic electrical quantities; evaluate measurement errors and test electrical measuring instruments. **Have skills**: handling of modern technology, use of information technology in the field of professional activity; acquiring new knowledge necessary for daily professional activities and continuing education in the magistracy. **Competences**: apply methods of protection and first aid in emergency situations, be aware of the need to form new competencies to solve practical problems; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in their professional activities; to realize the need to form new competencies to solve practical problems in the field of information systems and technologies.

Application 5

5	**The name of the discipline**	**Basics of Electronics**
1	Code of Discipline	BE 22(2)13
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,3
5	Prerequisites	Mathematics 1, Physics
6	Post requisites	Robotics
7	Purpose of study	Provide basic training in electronics required for the operation of electrical and electronic systems, automation devices, transmission technology, information reproduction.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, the student must: Know: basic information about vacuum and semiconductor devices, rectifiers, oscillatory systems, antennas; amplifiers, generators of electrical signals; general information about the propagation of radio waves; the principle of signal propagation in communication lines; information about fiber-optic lines; digital methods of information transmission; general information about the element base of circuitry; logical elements and logical design in the basis of microcircuits; functional units; digital-to-analog and analog-to-digital converters; foundations of the theory of four-poles; device, physical processes, characteristics and parameters, mathematical and electrical models of electronic devices, elements and components of integrated circuits, construction principles, basic circuit solutions of analog electronics devices, their main parameters and characteristics, bases of analysis and mathematical description, implementation features, areas of application; Be able to: calculate by various methods linear passive and active circuits, give a physical interpretation of the results obtained; reasonably choose semiconductor devices and integrated circuits in the development of simple electronics devices, taking into account the requirements for systems and complexes, choose the necessary blocks and components on the electronic services market, read and comprehend ready-made circuitry solutions, perform calculations of operating modes, characteristics and parameters of simple electronic devices; Have skills: analysis of DC and AC circuits in the time and frequency domains; calculation and experimental research, carrying out an automated experiment in the laboratory; Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in professional activities; to be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 6

6	**The name of the discipline**	**Numerical methods**
1	Code of Discipline	NM 22(2)13
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,3
5	Prerequisites	Mathematics 1
6	Post requisites	Methods, models in management in the road industry.
7	Purpose of study	Familiarization with the basic definitions and concepts of computational mathematics, the structure of computational mathematics, the main tasks, methods and algorithms of computational mathematics. Students should learn how to approximately solve linear algebra problems; nonlinear equations and systems; interpolate functions; perform numerical integration and differentiation; solve differential equations; use approximation and approximation of functions
8	Summary of disciplines	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 methods in professional activities, solving simple professional tasks related to the road industry. Used active teaching methods: lecture visualization; case study; contextual learning.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: terminology, basic concepts and definitions of computational mathematics; error theory; theory of approximation of functions; the theory of numerical differentiation and numerical integration, as well as methods for solving linear and nonlinear equations, numerical methods for solving ordinary differential equations and partial differential equations. **To be able to:** Choose the right numerical method for solving a specific problem; to calculate and analyze the errors of the numerical method; to understand and put into practice computer technologies for the numerical solution of practical problems. **Have skills**: solving practical problems using numerical methods. **Competences:** apply information and communication technologies for searching and processing information; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in their professional activities; develop and / or use software, hardware, information, mathematical, functional and organizational support of information systems, including algorithms and information security methods.

Application 7

7	**The name of the discipline**	**Digital road infrastructure management**
1	Code of Discipline	DRIM 22(2)14
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,4
5	Prerequisites	Information and communication technologies
6	Post requisites	Digital interfaces for data transmission. Methods, models in the management of the road industry. Telematics in the road industry.
7	Purpose of study	Students gain knowledge in the field of digital transport systems management. In the course of studying the discipline, students will master a new ideology of interaction between vehicles and infrastructure, which consists in a comprehensive information exchange between them with a simultaneous decrease in the role of a person in management. All this will help to reduce transportation costs and increase the growth of throughput due to the transition to optimal modes of infrastructure functioning.
8	Summary of disciplines	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).
9	Expected results	As a result of mastering the discipline, the student must: Know: the importance and place of digital technologies in the management of the infrastructure of the road industry; the essence of management processes, automation of information systems; methods and areas of their application; methodology for the implementation of digital technologies, the main industry standards. Be able to: highlight the main objects of automation; to characterize the essence and evolution of digital management technologies in the road industry; use basic approaches to the choice of digital information systems. Skills: independently apply modern computer technologies to solve research and production-technological problems of professional activity; own the methodology for the implementation of information systems; approaches to project management in terms of automation in the road industry; the main methods of calculating the indicator of the total cost of projects. Competencies: to use scientific methods and research techniques of a specific science; summarize research results; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis; analyze specific and general problems of the functioning of the biosphere and rational use of natural resources to reduce the impact on human health and the environment; independently apply modern computer technologies to solve research and production and technological problems of professional activity; build work in a team, tolerantly perceive social, ethnic, confessional and cultural differences; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); demonstrate mastery of techniques and methods of operation of modern computers and equipment. determine the requirements for the design of the network architecture, software and hardware of the computer network; prepare technical documentation for the design of information systems and software development.

Application 8

8	**The name of the discipline**	**Digital logistics**
1	Code of Discipline	DL 22(2)14
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	2,4
5	Prerequisites	Information and Communication Technology
6	Post requisites	Digital management by industry.
7	Purpose of study	Students acquire knowledge and skills in the use of digital logistics for various purposes, as well as familiarization with information and legal issues related to the implementation of projects of modern digital logistics systems.
8	Summary of disciplines	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).
9	Expected results	As a result of mastering the discipline, the student must: Know: the main provisions of the concept of the digital economy, the direction of making effective management decisions in the functional areas of logistics To be able to: apply in practice methods of choosing tools and information technologies for information processing when making managerial decisions in the functional areas of logistics; develop, adapt and implement high-load applications; prepare technical documentation for the design of information systems and software development. Skills: independently apply modern computer technologies to solve research and production-technological problems of professional activity; own the methods and tools of the digital economy for making effective management decisions in the functional areas of logistics Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; build work in a team, tolerantly perceive social, ethnic, confessional and cultural differences; to understand the nature of entrepreneurship and how to manage it as a process, to determine the areas in which entrepreneurship is manifested, including a startup in professional activity; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 9

9	**The name of the discipline**	**IT – projects management**
1	Code of Discipline	ITPM 22(2)15
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	Information and communications technology. Algorithms, data structures, and programming
6	Post requisites	The material of this discipline is used during students' coursework and diploma works and projects.
7	Purpose of study	Formation of a system of theoretical knowledge and practical skills necessary for project managers and members of the project team in the planning, management and execution of IT projects
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the conceptual apparatus of project management; the best world practices, composition and content of international and national guidelines and project management standards (PMI PMBOK, ST RK ISO 21500: 2012); principles and methodologies of Agile approaches to IT project management; structure and typical content of an IT project; architecture and functionality of project management information systems; **To be able to:** draw up, analyze and optimize an IT project work plan; plan resources for the implementation of an IT project; apply information systems to solve practical project management problems. **Have skills:** building a network schedule for the project and calculating the critical path; resource allocation and planning; analysis of project risks and determination of response measures to them; preparation and presentation of the project. **Competences:** to be aware of the need for the formation of new competencies to solve practical problems in the field of information systems and technologies; to build work in a team, to tolerate social, ethnic, confessional and cultural differences; realize the need for self-organization and self-education, critically rethink the accumulated experience, change, if necessary, the type and nature of their professional activities. to understand the nature of entrepreneurship and how to manage it as a process, to determine the areas in which entrepreneurship is manifested, including a startup in professional activity. use in professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information). develop, adapt and implement high-load applications. apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools. prepare technical documentation for the design of information systems and software development.

Application 10

10	**The name of the discipline**	**Information systems in business and management**
1	Code of Discipline	ISBM 32(2)15
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	Information and communication technology. OIC. DB in IS
6	Post requisites	Multiprocessor computing systems (OLTP, DM, DW, DSS). The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Mastering by students of general principles, concepts and modern methods in the field of information resource management at all stages of the life cycle of information systems. Formation of skills of rational regulation of information flows, ensuring the consistency of internal and external variables of the organization.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** methods of managing professionally oriented information systems; creation and implementation of information systems in the activities of organizations; bases of standardization and certification in the field of professional activity; legal basis for standardization and certification, main objectives and objects of certification, terms and definitions in the field of certification. **To be able to:** o form new competencies for solving practical problems in the field of information systems and technologies; use in professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); develop information systems infrastructure, including databases, operating systems, application software, etc .; demonstrate proficiency in techniques and methods of operation of modern computers and equipment. **Have skills:** application of methods and means of protecting information infrastructure, information resources and technologies; determine the requirements for the design of the network architecture, software and hardware of the computer network; develop, adapt and implement high-load applications; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development. **Competences:** apply in professional activity modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; to show the ability to be included in the innovative structure of interaction in the field of professional activity, developing critical, problem-oriented thinking and the desire for physical self-improvement; support the processes of creation, management, modernization and promotion of information resources (IR) of the organization (web content, text, graphic and multimedia content of websites, information support of business processes of organizations), formulate requirements for the structure and services of the organization's IR, model business processes, test the organization's IR

Application 11

13	**The name of the discipline**	**Creating a startup**
1	Code of Discipline	C S 32(2)16
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	ICT, Robotics
6	Post requisites	Digital media technologies, Digital marketing by industries
7	Purpose of study	Formation of a scientific understanding of start-up projects, goals and results, features and differences between start-up projects and business plans.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: the essence of the automated control system as a tool to optimize management in transport processes; organization methods and ways to improve the accounting and workflow system. **To be able to:** use scientific methods and techniques for studying a specific science; summarize research results; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis; realize the need for self-organization and self-education, critically rethink the accumulated experience, change, if necessary, the type and nature of their professional activities; to understand the nature of entrepreneurship and how to manage it as a process, to determine the areas in which entrepreneurship is manifested, including a startup in professional activity; evaluate a business idea, market, competitors; present a business idea and startup strategy in writing, substantiate its feasibility, develop an action plan; draw up a marketing plan, incl. using methods of project advancement at the initial stage in conditions of limited financial and human resources; estimate the financial costs of a startup. **Have skills:** using a methodology for describing the economy of a startup, calculating indicators of its effectiveness and implementation; develop, adapt and implement high-load applications; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development. **Competencies:** to show the ability to be included in the innovative structure of interaction in the field of professional activity, developing critical, problem-oriented thinking and the desire for physical self-improvement; support the processes of creation, management, modernization and promotion of information resources (IR) of the organization (web content, text, graphic and multimedia content of websites, information support of business processes of organizations), formulate requirements for the structure and services of the organization's IR, model business processes, test the organization's IR; apply the skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes.

Application 12

12	**The name of the discipline**	**Automation of business documentation**
1	Code of Discipline	ABDS 32(2)16
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	ICT, Basics of Information Systems, Basic data in IS.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation in students of a system of knowledge and skills in working with electronic documents, which are necessary for the effective management of the business process of an enterprise.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, the student must: Know: the laws and terminology of document management, the patterns of document formation in the business process of the company; organization of document circulation, control of execution of documents and information and reference work using modern computer information technologies. Be able to: develop clear and structured abstractions and algorithms for management processes related to electronic document management and interaction between employees of the organization, as well as for external relations with clients of organizations. Apply in practice the provisions of the legislative and regulatory-methodological acts of the Republic of Kazakhstan on the issues of office work. Have skills: execute scripts that implement typical actions related to document management (docflow) and business processes of document management and interaction between employees within the organization and employees of the organization with its customers (workflow). Competencies: organize, plan and control the work of the office work (management documentation support); implement unified documentation systems in the organization's business process; draw up documents in accordance with the requirements of state standards; determine the historical and practical value of documents.

Application 13

11	**The name of the discipline**	**Digital interfaces of data transmission**
1	Code of Discipline	DIDT 32(2)16
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	**ICT.OIS**
6	Post requisites	Digital Media Technologies, .NET Core Application Development, Telematics in the Road Industry.
7	Purpose of study	Training the specialists capable of competently and efficiently designing ergonomic digital user interfaces of automated information processing and control systems.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** scientific methods and techniques for studying a specific science; summarize research results; methods of ergonomic design of digital interfaces; methods of system-wide design of interfaces of human-computing environment; exchange protocols, technical and operational characteristics of interfaces. **To be able to:** use various types of ICT in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; to formulate requirements for hardware and software that provide interaction with the computing environment; make a selection and justification of design solutions for the organization of interfaces of computer systems. **Have skills:** Demonstrate proficiency in the techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; prepare technical documentation for the design of information systems and software development; connecting peripheral devices to the appropriate interfaces, building information and computing systems at the interface level. **Competences:** apply in professional activity modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; develop models of components of information systems, including models of databases and models of interfaces "human - electronic computer".

Application 14

14	**The name of the discipline**	**Metrology, standardization and quality management ****
1	Code of Discipline	M S QM 32(2)19
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	3,5
5	Prerequisites	Math, physics
6	Post requisites	IS projecting for road industry. Material of this disciplin is used during the students' performing different calculation and design, diploma works and projects.
7	Purpose of study	Study of scientific principles and methods of metrological support of production, standardization, certification and determination of their role in improving quality in the development of information systems. In the process of studying this discipline, the student will be able to independently prepare documentation on quality management, use standard methods of quality control of technological processes in the design, development and implementation of information systems, organize workplaces, their technical equipment (use of computer technology and computer networks), carry out control of compliance with technological discipline and environmental safety.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the general principles and basic scientific provisions of standardization, the theory of interchangeability and technical measurements, the current standards in the field of IT, the principles of their construction and the method of application; - basic concepts, terms and definitions related to standardization, certification and metrology; basic concepts of qualimetry; technical measurements, methods, methods and means of control in the development of IS; indicators of the level of IP quality and the basis of quality management. **To be able to:** use modern methods of control of IS, technological processes of their design; assign appropriate control methods when developing information processes; use the applicable standards when setting quality parameters; technically competently draw up technical documentation; learn to work with educational, methodological and reference literature. **Have skills**: be proficient in the methods of monitoring compliance with the technological process and environmental safety; methods of organizing metrological support of technological processes, using standard methods of quality control of IS and ICT; measurement methods and methods of processing measurement results; methods and techniques used in metrology, standardization and certification of information products. **Competencies:** apply information and communication technologies to search and process information; be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; use various types of ICT in professional and personal activities; demonstrate mastery of techniques and methods of operation of modern computers and equipment; determine the requirements for the design of the network architecture, software and hardware of the computer network.

Application 15

15	**The name of the discipline**	**Methods, models in the management of the road industry**
1	Code of Discipline	MMMRI 32(2)17
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Mathematics, Information and Communication Technologies
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation of solid theoretical knowledge and practical skills in future specialists, allowing them to successfully work in the construction and numerical analysis of mathematical models of various technical objects and systems and, based on the results of this analysis, formulate recommendations for the improvement and modernization of such systems and objects
8	Summary of disciplines	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).
9	Expected results	As a result of mastering the discipline, the student must: know: - classification of models of systems and processes, their types and types of modeling; - principles and methodology of functional, simulation and mathematical modeling of systems and processes, - methods for constructing modeling algorithms; - methods of constructing mathematical models, their simplification, - hardware and software simulation tools; - experiment planning technology; - methods of statistical modeling on a personal computer; be able to: - use the basic methods of constructing mathematical models of processes, systems, their elements and control systems; - implement simple simulation algorithms; - work with any of the main types of software systems designed for mathematical and simulation modeling; - to plan a model experiment and process its results on a personal computer; - evaluate the accuracy and reliability of the simulation results; master the skills: - working with a software system for mathematical and simulation modeling; gain experience in building a mathematical model; model research; application of hardware and software for modeling. Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in professional activities; to be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); develop the infrastructure of information systems, including databases, operating systems, application software, etc.; apply software solutions that combine text, graphics, multimedia materials, as well as other interactive tools.

Application 16

16	**The name of the discipline**	**Business process modeling**
1	Code of Discipline	BPM 32(2)17
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Algorithms, data structure and programming
6	Post requisites	ERP and business opportunity management. Reengineering of business processes based on corporate EIS
7	Purpose of study	Mastering the theoretical foundations of process management, modeling, analysis and optimization of business processes of an organization (enterprise), the formation of practical skills in using the process approach in the work of an organization (enterprise).
8	Summary of disciplines	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).
9	Expected results	As a result of mastering the discipline, the student must: Know: conceptual foundations of enterprise architecture; basic principles and methods for describing and developing enterprise architecture; methods of analysis and modeling of business processes; basic programming technologies; principles of construction and architecture of computing systems; types of content of information resources of an enterprise and Internet resources, processes for managing the life cycle of digital content, processes for creating and using information services (content services). Be able to: develop and analyze enterprise architecture; to model, analyze and improve business processes; planning an IT project at all phases of its life cycle; choose smart IP and ICT for business management; manage the processes of the life cycle of enterprise content and Internet resources, manage the processes of creating and using information services (content services); systematize and summarize information, organize and conduct research in the field of economics, management and ICT, develop specific proposals based on research results, prepare reference and analytical materials for making management decisions Have skills: business communications in the professional field, teamwork; formalization, development of diagrams, analysis and modeling of business processes; the use of software tools for modeling business processes; formulating management decisions for reengineering business processes Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; to be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; to understand the nature of entrepreneurship and how to manage it as a process, to determine the areas in which entrepreneurship is manifested, including a startup in professional activity; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); apply software solutions that combine text, graphics, multimedia materials, as well as other interactive tools.

Application 17

17	**The name of the discipline**	**Modern operating Systems**
1	Code of Discipline	MOS 32(2)18
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Information and communication technologies, Programming technology
6	Post requisites	Architecture of computer systems and networks, Information security and information protection, Design of IS for the road industry.
7	Purpose of study	Acquaintance with the fundamental principles of the device of modern operating systems, the possibilities of applying fundamental concepts from the achieved technological level and specific requirements for a specific implementation, their relationship with various innovations in this area, as well as with modern trends in the development of operating systems.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know**: features of the IOS platform, IOS software stack; methodology for creating applications with a user interface using touch screens for the road industry; basic tools for developing and debugging mobile applications for the automotive industry. **To be able to:** develop and test mobile applications for the road industry; distribute created products; analyze the wishes of users who use the application; make corrections; create updates, instructions. **Have skills**: development of user interface and programming functionality, providing telephony support, sending / receiving SMS, managing connections via Wi-Fi, Bluetooth, Programming background services, notification mechanisms and alarms. **Competences:** the ability to use the basics of legal knowledge for use in various areas of life, use information and communication technologies to search and process information, create startups, use various types of ICT in professional and personal activities: Internet resources, cloud and mobile services for searching, storing processing, protection and dissemination of information, the ability to understand the principles of operation and methods of operation of modern computers and equipment, own methods and means of protecting information infrastructure, information resources and technologies, the ability to develop, implement and adapt application software, the ability to prepare technical documentation for software development and design information systems.

Application 18

18	**The name of the discipline**	**Business Process Automation**
1	Код дисциплины	BPA 32(2)18
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Information and communication technologies, Information systems in business and management
6	Post requisites	Multiprocessor computing systems (OLTP, DM, DW, DSS), ERP and business opportunity management. (ERP "Gala
7	Purpose of study	Formation of theoretical and practical skills, general skills, knowledge and ideas necessary and sufficient for the successful management of the company's business processes, regardless of its industry affiliation.
8	Summary of disciplines	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 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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** characteristics of models of business processes and methods of reorganizing business processes using modern automated systems in the practice of organizations; modern concept of business process management; foundations of the organizational structure; basic mathematical methods and models used in business process management; the consequences of organizational and managerial decisions. **To be able to:** use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); to model business processes and use methods of reorganizing business processes in the practical activities of organizations; set goals and formulate tasks related to the implementation of professional functions for the automated management of business processes; substantiate the need to use analytical and computer tools to solve problems of managing business processes; **Have skills:** analysis of the results of modeling business processes and reorganization of business processes in the practical activities of organizations; orientation in a modern dynamic environment; assessing and predicting the risks of decisions made regarding the modeling and reorganization of business processes. **Competences:** apply in professional activity modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; apply skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes; prepare technical documentation for the design of information systems and software development.

Application 19

19	The name of the discipline	**Introduction to the Internet of Things**
1	Code of Discipline	ITh I 32(2)19
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	ICT, BIS
6	Post requisites	The material of this discipline is used during students' coursework and diploma works and projects.
7	Purpose of study	To familiarize students with the basic principles of connections. new technological concept of the Internet of Things (IoT). The program explores the concept of bringing people, processes, data and things together to improve the efficiency and value of network connections. In addition to the theoretical part, the practice-oriented educational program of the course is based on the study of real cases for the implementation of Internet of Things technologies and the creation of prototypes of IoT devices.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, the student must: Know: the principles of organization and functioning of the Internet of Things; the main factors in the development of the Internet of Things; existing technologies in the field of the Internet of things; main trends and directions in the field of the Internet of Things, the main provisions of the concept of the industrial Internet of Things IIoT; main types and principle of operation of IoT equipment on the market; technologies and protocols used to create IoT solutions. Be able to: work with microcontrollers and main debug boards (Arduino); understand existing IoT technologies and apply them to specific scenarios; analyze the structure of the structure, highlight parts, their shape, determine the relative position (symmetry, asymmetry), types of connection of parts; read and execute technological documentation. Have skills: programming end devices; on connecting end devices to the network; to create a software solution for data processing and storage using cloud technologies. Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; demonstrate personal and professional competitiveness: build a personal educational trajectory for self-development and career growth; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in professional activities; to be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; determine the requirements for the design of the network architecture, software and hardware of the computer network; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 20

20	**The name of the discipline**	**Certification and technical documentation**
1	Code of Discipline	C TD 32(2)19
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	ICT
6	Post requisites	Information security and information protection. IC design for the road industry. The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	The purpose of studying the discipline is the acquisition by students of knowledge on the application of the certification system in the formation of technical documentation in accordance with the current regulatory framework; use the quality system documentation in professional activities; bring non-system measurement values in accordance with applicable standards and the international system of SI units
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** national and international standardization and certification system and product quality assurance system; basic concepts and definitions of standardization and certification; provisions of systems (complexes) of general technical and organizational and methodological standards; certification, systems and certification schemes; main types of technical and technological documentation, standards for the preparation of documents, regulations, protocols. **To be able to:** apply the requirements of regulatory documents to the main types of products (services) and processes; apply quality systems documentation; Apply the basic rules and documents of the certification system of the Republic of Kazakhstan. **Have skills**: use of up-to-date legal and regulatory documentation in the specialty; apply modern scientific and professional terminology. **Competencies:** apply information and communication technologies to search and process information; own a competent oral and written presentation of their thoughts on professional topics; apply in professional activity the normative documents of the International Organization for Standardization (ISO). International Electrotechnical Commission (IEC). International organizations participating in the work of ISO. Conduct metrological expertise and metrological control of design and technological documentation. Search, analyze and interpret the information necessary to fulfill the tasks of professional activity. Prepare technical documentation for the design of information systems and software development.

Application 21

21	The name of the discipline	Computer games programming
1	Code of Discipline	PCG 32(2)20
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Algorithms, Data Structures and Programming, Programming Technology
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Effectively apply the methods of mathematical modeling, computer graphics technology, human-computer interaction, as well as sound technologies to the problems of developing computer games with high aesthetic indicators, information and artistic expressiveness and compositional integrity.
8	Summary of disciplines	The discipline forms a complex of knowledge, skills and abilities in the field of computer game development implemented in the Python programming language 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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** programming languages and application software used for the development of computer games; the capabilities of the Python programming language when developing applications with a graphical interface; the structure of the Python tkinter and PyGame libraries; principles of game design, roles of participants in the development of computer games, responsibilities of members of the development team (game designer, artist, programmer, sound engineer, tester). **To be able to:** develop algorithms and software for solving problems of developing computer games; to develop the idea of the game and the game process of interaction between the game and the player, the design of the design of computer games; document the process of developing computer games; work in a team, create an interesting and high-quality intellectual product. **Have skills:** engineering development (design, coding, debugging, testing) and implementation of science-intensive software solutions in the field of computer games development; organizational and managerial activities, including project management or phases of projects for the development and implementation of science-intensive software solutions, including collecting product requirements, planning production processes and resources; development of a graphical user interface, programming of interactive graphical applications. **Competences:** to be aware of the need for the formation of new competencies to solve practical problems in the field of information systems and technologies; to understand the nature of entrepreneurship and how to manage it as a process, to determine the areas in which entrepreneurship is manifested, including a startup in professional activity; use in professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 22

22	**The name of the discipline**	**Digital media technologies**
1	Code of Discipline	DMT 32(2)20
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	3,6
5	Prerequisites	Information and communication technologies, Algorithms, data structures and programming, Programming technology.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Training in the field of information technology, which makes it possible to effectively apply methods of mathematical modeling, computer graphics technology, human-computer interaction in the field of computer graphics creation, data processing, analysis and visualization.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** programming languages and application software used to develop applications that implement digital media technologies; the capabilities of the Python programming language when developing applications with a graphical interface; the structure of the Python tkinter matplotlib and Pygal libraries; principles of data processing, analysis, visualization, mathematical processing methods and models of information presentation. **To be able to:** develop algorithms and software for solving problems of data processing, analysis and visualization; develop user interface design and information presentation; document the application development process; work in a team, create an interesting and high-quality intellectual product. **Have skills**: engineering development (design, coding, debugging, testing) and implementation of high-tech software solutions in the field of application development that implement digital media technologies; organizational and managerial activities, including the management of projects or phases of projects for the development and implementation of science-intensive software solutions, including collection of product requirements, planning of production processes and resources; development of a graphical user interface, programming of interactive graphical applications. **Competences:** to be aware of the need for the formation of new competencies to solve practical problems in the field of information systems and technologies; use in professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information; demonstrate mastery of techniques and methods of operating modern computers and equipment; use software solutions that combine text, graphic , multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 23

23	**The name of the discipline**	**Architecture of computer systems and networks**
1	Code of Discipline	ACS NW 42(2)21
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information and communication technologies, Modern operating systems. GIS
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Acquaintance with mathematical models and methods of parallel programming for multiprocessor computing systems necessary for solving complex applied problems with a large amount of computation.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the organization of common parallel computing systems, their most important architectural features and areas of effective use of specific types of parallel computing systems; architectural principles for the implementation of parallel processing in computers; methods and language mechanisms for constructing parallel programs. **To be able to:** use theoretical knowledge and practical skills to develop parallel computing systems with different architectures, present the main problems of parallel programming and possible ways to solve them. **Have skills**: using multiprocessor computing systems; application of parallel algorithms for solving professional problems; application of applied programs for multiprocessor computing systems. **Competencies:** apply information and communication technologies to search and process information; be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; develop infrastructure of information systems, including databases, operating systems, application software, etc.

Application 24

24	**The name of the discipline**	**Multiprocessor computing systems (OLTP, DM, DW, DSS)**
1	Code of Discipline	MCS42(2)21
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information systems in business and management. IT project management. Business process automation.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Acquaintance with mathematical models and methods of parallel programming for multiprocessor computing systems necessary for solving complex applied problems with a large amount of computation.
8	Summary of disciplines	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 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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the organization of common parallel computing systems, their most important architectural features and areas of effective use of specific types of parallel computing systems; architectural principles for the implementation of parallel processing in computers; methods and language mechanisms for constructing parallel programs. **To be able to:** use theoretical knowledge and practical skills to develop parallel computing systems with different architectures, present the main problems of parallel programming and possible ways to solve them. **Have skills**: using multiprocessor computing systems; application of parallel algorithms for solving professional problems; application of applied programs for multiprocessor computing systems. **Competencies:** apply information and communication technologies to search and process information; be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; develop infrastructure of information systems, including databases, operating systems, application software, etc.

Application 25

25	**The name of the discipline**	**Information security and information protection**
1	Code of Discipline	ISIS 42(2)22
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information and communication systems. Modern information systems.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Mastering the theoretical foundations of the construction and practice of using information security systems in information systems, teaching students a systematic understanding of the principles, methods and means of implementing data security, acquiring practical skills in information security in information systems necessary for their design and operation
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the relevance and importance of the information security problem; goals, objectives, principles and main directions of information security; the main provisions of legislation in the field of modern copyright and information protection; evolution, trend and prospects for the development of methods and means of protecting computer information; basic methods of protecting confidential computer information; basic concepts used in the field of information security; information security threats and classification of channels of unauthorized access to information; modern approaches to building information security systems. **To be able to:** analyze the information structure; make adequate decisions when choosing information protection tools based on threat analysis; select and analyze quality indicators of the system and individual methods and means of information protection; identify and analyze the threat to information security, depending on the operating environment of information technology products; develop models of components of information security systems; use modern software to encrypt and hide information; choose the best methods for protecting confidential information; develop and create new standard information protection schemes based on modern information security tools. **Have skills:** create a secure environment using hardware and software protection; development of secure applications; independent design of information security systems; know how to deal with information security threats. **Competencies:** independently apply modern computer technologies to solve research and production-technological tasks of professional activity; use in professional and personal activities various types of ICT (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); apply methods and means of protecting information infrastructure, information resources and technologies

Application 26

26	**The name of the discipline**	**Security and protection of economic data**
1	Code of Discipline	SPED 42(2)22
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information and communication technologies, Business process automation
6	Post requisites	The material of this discipline is used when students perform various design and calculation works, theses and projects.
7	Purpose of study	Training students in various concepts of comprehensive information security, acquiring practical skills in building protection systems against the threat of information leakage through various channels, determining the cost-effectiveness of ensuring the information security of an enterprise (organization).
8	Summary of disciplines	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; brainstorming; individual projects.
9	Expected results	As a result of mastering the discipline, the student must: Know: basic concepts of security and data protection, main directions of information protection, legislation of the Republic of Kazakhstan in the field of information protection, modern methods and means of data protection in information and telecommunication systems. Be able to: analyze and apply security and data protection models, develop and create new standard data protection schemes based on modern information security tools, take preventive measures to protect data based on threat analysis. Have the skills: apply information and communication technologies when solving standard problems of professional activity, taking into account the basic requirements of information security and the protection of economic data; use of software that provides access to information systems and computer networks. Competencies: the ability to apply techniques for protecting information and trade secrets, as well as practical skills for the successful management of intellectual property; the ability to collect, analyze, systematize, evaluate and interpret data necessary to solve professional problems; the ability to competently apply legislation on informatization and information protection in professional activities in order to ensure the information security of business entities.

Application 27

27	**The name of the discipline**	**Systems of automation of activity of the enterprise (1C: Enterprise)**
1	Code of Discipline	AS for EA IS 42(2)23
2	Number of credits, ECTS	4
3	Course, semester	HK, GED and IS
4	Курс, семестр	4,7
5	Prerequisites	Databases in information systems, ICT.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation of students' knowledge and skills necessary to manage the organization's information systems. These systems manage the financial and economic activities of the enterprise, ensure the adoption of informed management decisions based on high-quality and reliable information obtained using modern management and information technologies.
9	Summary of disciplines	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.
10	Expected results	As a result of mastering the discipline, **the student must:** **Know:** The structure and composition of functional tasks of management systems of organizations; capabilities of typical information systems for managing organizations; methods of development, implementation and adaptation of applied software based on the 1C: Enterprise 8. * platform; principles and methods for solving applied problems based on the 1C: Enterprise 8. * platform; standards for the development of technical documentation based on the 1C: Enterprise 8. * platform. **To be able to:** use various types of ICT in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information; apply methods and means of protecting information infrastructure, information resources and technologies; generate reports in 1C: Enterprise mode (in user mode); administer the 1C: Enterprise version 8. * system; perform elementary settings of typical configurations in the configuration mode. **Have skills:** develop information systems infrastructure, including databases, operating systems, application software, etc .; formation of requirements for an information system developed on the basis of 1C Enterprise 8. *; prepare technical documentation for the design of information systems and software development. **Competencies:** to carry out installation, configuration, testing and maintenance of system and application software for high-load computer systems and networks; apply information and communication technologies to search and process information; apply skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes; prepare technical documentation for the design of information systems and software development.

Application 28

28	**The name of the discipline**	**ERP and business opportunity management. (ERP "Galaxy")**
1	Code of Discipline	ERP BOM. 42(2)23
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information systems in business and management. Business processes automation.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation of knowledge that allows you to create a holistic view of modern corporate information ERP-systems and the underlying methodologies of enterprise management. The discipline allows you to study the practical aspects of using these software products in the process of managing a company in the production sector.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** information technology used in ERP systems; classification, structure and functionality of ERP systems. **To be able to:** develop a concept for an ERP system capable of supporting all key business processes of an enterprise, such as planning, accounting, control and analysis in all areas of main and auxiliary activities. **Have skills**: Demonstrate proficiency in the techniques and methods of operation of modern computers and equipment; develop the infrastructure of information systems, including databases, operating systems, application software, etc. selection of methods and technologies for the implementation of an ERP system in the enterprise. **Competencies:** to carry out installation, configuration, testing and maintenance of system and application software for high-load computer systems and networks; support the processes of creation, management, modernization and promotion of information resources (IR) of the organization (web content, text, graphic and multimedia content of websites, information support of business processes of organizations), formulate requirements for the structure and services of the organization's IR, model business processes, test the organization's IR; apply skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes; prepare technical documentation for the design of information systems and software development.

Application 29

29	**The name of the discipline**	**Digital marketing by industry**
1	Code of Discipline	DMI 42(2)24
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	OIS, IT-infrastructure, Automation of business documentation.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Studying the conceptual foundations of applying digital marketing methods and techniques for their implementation in the system of marketing activities at the organizational level, acquiring knowledge and competencies in the field of promoting the organization and effectively using the channels for promoting goods.
8	Summary of disciplines	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; discussion.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** the peculiarities of using IT in solving marketing problems and making organizational and managerial decisions; how to independently and correctly choose marketing tools for conducting an effective advertising campaign for enterprises on the Internet. **To be able to:** summarize research results; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis; use various types of ICT in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information; to be aware of the need for the formation of new competencies to solve practical problems in the field of information systems and technologies. plan the processes of marketing communications on the Internet. **Have skills:** Demonstrate proficiency in the techniques and methods of operation of modern computers and equipment; application of technology for building marketing web communications to solve the problems of promoting goods and services, analysis and selection of general-purpose services for solving marketing problems; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools. **Competencies:** to show communication skills and psychological readiness for work, including when working in a team and make managerial and technical decisions; apply in professional activities modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; apply the skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes. support the processes of creation, management, modernization and promotion of information resources (IR) of the organization (web content, text, graphic and multimedia content of websites, information support of business processes of organizations), formulate requirements for the structure and services of the organization's IR, model business processes, test the organization's IR.

Application 30

30	**The name of the discipline**	**Digital management by industry**
1	Code of Discipline	DMI42(2)24
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	IT infrastructure, Information systems in business and management.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation of the foundations of theoretical and practical knowledge about the principles of management in the context of the transformation and digitalization of the world economy and business, as well as the acquisition of skills for the independent use of the knowledge gained in current professional activities.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** business models and the content of business processes of the enterprise; basic concepts of digital management for making management decisions; the digital environment in the organization; elements of the information support system for digital management; methods and modern information technologies of search, systematization and processing of data necessary for carrying out economic calculations; the process of developing and implementing digital management, methods for assessing the company's strategy. **To be able to:** summarize research results; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis; evaluate management decisions based on digital management indicators; use various types of ICT in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information; use sources of economic, regulatory and legal information and search for information on the received assignment, collect, analyze data necessary for conducting economic calculations for business management purposes; apply information technology to solve management problems. **Have skills:** possession of software for working with business information and Internet technologies; be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; using business models and communication methods; develop, adapt and implement high-load applications; develop infrastructure of information systems, including databases, operating systems, application software, etc. **Competencies:** to show communication skills and psychological readiness for work, including when working in a team and make managerial and technical decisions; apply information and communication technologies to search and process information; be aware of the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; apply skills of entrepreneurship, innovation, creativity, reengineering of business processes, management of possible risks in business processes; use various types of ICT in professional and personal activities; develop and use technical and software documentation of various types based on domestic and foreign documentation standards.

Application 31

31	**The name of the discipline**	**Designing of IS in the auto- road industry**
1	Code of Discipline	DISRI 43(2)07
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Fundamentals of Information Systems, Databases in IS, IT Project Management
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Systematization and deepening of the acquired knowledge, as well as the study of various methods of software development and the acquisition of professional skills in the design of information systems in the road industry.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, **the student must:** **Know:** scientific methods and techniques for studying a specific science; summarize research results; synthesize new knowledge and present it in the form of humanitarian socially significant products; make a choice of methodology and analysis; software development process; language for defining and analyzing tasks in the design of IS; methods of testing software modules of the IS. **To be able to:** realize the need for the formation of new competencies for solving practical problems in the field of information systems and technologies; develop a user interface for IP software; conduct a professional analysis of requirements (C-customer requirements, D-developer requirements); apply methods and means of protecting information infrastructure, information resources and technologies; determine the requirements for the design of the network architecture, software and hardware of the computer network; develop infrastructure of information systems, including databases, operating systems, application software, etc. **Have skills:** to independently apply modern computer technologies to solve research and production-technological tasks of professional activity; to maintain documentation for the integration and testing of a software product; using tools for developing software applications; detailed design, implementation of modules and maintenance of the software system. **Competences:** apply in professional activity modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; support the processes of creation, management, modernization and promotion of information resources (IR) of the organization (web content, text, graphic and multimedia content of websites, information support of business processes of organizations), formulate requirements for the structure and services of the organization's IR, model business processes, test the organization's IR; develop and / or use software, hardware, information, mathematical, functional and organizational support of information systems, including algorithms and methods of information security; develop and use technical and software documentation of various types based on domestic and foreign documentation standards.

Application 32

32	**The name of the discipline**	**The software design of the EIS**
1	Code of Discipline	SDEIS 43(2)07
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Programming technology, Databases in IS, Object-oriented programming
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	To get acquainted with the processes, models and stages of the software life cycle of economic information systems, as well as with structural and object-oriented approaches to software design..
8	Summary of disciplines	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; discussion.
9	Expected results	Expected results As a result of mastering the discipline, **the student must:** **Know:** basic knowledge in the field of mathematics and natural sciences, their use in professional activities; scientific methods and techniques for studying a specific science; summarize research results; engineering programming goals, software life cycle standards, economic justification of software models. **To be able to:** develop, adapt and implement high-load applications; develop information systems infrastructure, including databases, operating systems, application software, etc .; apply object-oriented methods of analysis in software development, estimate the complexity of software development. **Have skills:** Demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development; development of design and software documentation, development of software applications. **Competences:** apply in professional activity modern programming languages, system engineering methodology, design automation systems, modern information technology standards, including methods and tools for building information security systems of modern ICT; to install, configure, test and maintain system and application software for high-load computer systems and networks; develop and / or use software, hardware, information, mathematical, functional and organizational support of information systems, including algorithms and methods of information security.

Application 33

33	**The name of the discipline**	**Programming C#**
1	Code of Discipline	PC 43(2)08
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Algorithms, data structure and programming, Programming technology
6	Post requisites	The material of this discipline is used during the execution of various design and engineering works, theses and projects by students.
7	Purpose of study	Studying the theoretical foundations of modern programming technologies and obtaining practical skills in their implementation.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline , the student must: **Know:** models, methods and technologies of parallel programming; fundamentals of user-defined programming structures; programming of recursive algorithms; methods of program design; modular programs; fundamentals of methodology for estimating time and capacity complexity of software; metrics of software development; fundamentals of modern approaches and technologies of software development, their classification and theoretical foundations. **To be able to:** make algorithms for solving a specific problem, choosing a solution method and compiling an appropriate program; create console / window applications in Visual Studio .NET; create and use classes and objects in a C# application; use the concepts of encapsulation, inheritance and polymorphism in console/window applications; Creating graphs and topics; explain the compiled software documentationproject and implement programs in a high-level language; use methods of testing, debugging and documenting programs; apply algorithmic methods of software development cost estimation; write programs in C#; form requirements for the development of various types of information and software tools; choose the most suitable tool environment for solving professional tasks. **Have skills:** skills of using modern methods of software development; knowledge of the methodology of compiling, testing and debugging programs in C#; evaluation of the time and capacity complexity of software; learning new programming languages and information technologies; correct self-development; possess methods and tools for analysis and modeling of the subject area. **Competencies:** have the skills of handling modern technology, be able to use information technology in the field of professional activity; possess the tools of data processing and analysis in order to substantiate the design decisions made; carry out the formulation and execution of experiments to verify the correctness of software, IS and their effectiveness; have the skills of modeling, analysis and use of formal methods of designing IS and reliable, correct software.

Application 34

34	**The name of the discipline**	**Python Packages**
1	Code of Discipline	PP 43(2)08
2	Number of credits, ECTS	5
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Algorithms, data structures and programming, Programming technology
6	Post requisites	The material of this discipline is used during the execution of various design and engineering works, theses and projects by students.
7	Purpose of study	Training in the field of information technology, which makes it possible to effectively apply methods of mathematical modeling, data analysis, computer graphics technology, human-computer interaction, as well as sound technologies to the tasks of developing programs for various purposes with information and artistic expressiveness and compositional integrity.
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline , the student must: **To know:** programming languages and application software tools used for program development; the capabilities of the Python programming language in the development of applications with a graphical interface; the structure and purpose of Python packages tkinter, PyGame, Pandas and matplotlib libraries. **To be able to:** develop algorithms and software for solving various practical problems; develop the game process of interaction between the game and the player, design the design of computer games; use Python capabilities for data visualization and analysis, document the process of developing computer programs; work in a team, create an interesting and high-quality intellectual product. **Have skills:** engineering development (design, coding, debugging, testing) and implementation of high-tech software solutions in the field of computer program development, including collecting product requirements, developing a graphical user interface, programming interactive graphical applications. **Competencies:** be aware of the need to form new competencies to solve practical problems in the field of information systems and technologies; understand the nature of entrepreneurship and how to manage it as a process, identify areas in which entrepreneurship manifests itself, including a startup in professional activities; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information); demonstrate proficiency in the techniques and methods of operation of modern computer technology and equipment; apply software solutions that combine text, graphics, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 35

35	**The name of the discipline**	**Telematics in the road industry**
1	Code of Discipline	TRI 43(2)09
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information and Communication Technology, Digital Management of Road Infrastructure
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	Formation of knowledge in the field of using the capabilities of telecommunication technologies and informatics in solving technological problems in transport, their competent application in practice to improve the efficiency of road transport
8	Summary of disciplines	The discipline forms knowledge about the principles of operation and technical and operational characteristics of the main devices of telematics systems, methods and technologies for automated regulation of traffic flow, telematics intelligent systems; practical skills in analyzing the technical condition and technological processes of transport, choosing telematics equipment, using software, information technology. Active teaching methods used: situational tasks modeling telematics in transport; discussions; presentations.
9	Expected results	As a result of mastering the discipline, the student must: Know: the main directions of the functioning of information systems in road transport; methods, methods, means, sequence and content of stages of operation of telematic systems in vehicles; types of satellite communication systems, especially the choice and their use in vehicles; basic measures to protect information of telematic systems. Be able to: work with packages of applied software; to form information systems of a motor transport enterprise, a car service enterprise and an information system of car telematic systems; to investigate the effectiveness of the telematics systems being created in vehicles, to conduct a marketing analysis of their use. Have skills: application in practice of the current laws and regulations; analysis of the operation of the main units and devices of modern telematic systems of a motor transport enterprise and a car; maintaining the operability, detecting and eliminating malfunctions in the operation of the electronic hardware of the vehicle telematics systems; the use of software and hardware for ensuring information security of telematic systems of a motor vehicle and a car. Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; use various types of ICT in professional and personal activities (Internet resources, cloud and mobile services for searching, storing, processing, protecting and distributing information); demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; determine the requirements for the design of the network architecture, software and hardware of the computer network; develop the infrastructure of information systems, including databases, operating systems, application software, etc.; apply software solutions that combine text, graphic, multimedia materials, as well as other interactive tools; prepare technical documentation for the design of information systems and software development.

Application 36

36	**The name of the discipline**	**BigData technologies and cloud computing**
1	Code of Discipline	BDT CC 43(2)09
2	Number of credits, ECTS	4
3	Department	HK, GED and IS
4	Course, semester	4,7
5	Prerequisites	Information and communication technologies, OIS, IT infrastructure, Client-server applications.
6	Post requisites	The material of this discipline is used during the performance by students of various computational and design works, diploma theses and projects.
7	Purpose of study	mastering the principles, methods, technologies and tools for using BigData and cloud computing, the features and prospects of their use in IS..
8	Summary of disciplines	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.
9	Expected results	As a result of mastering the discipline, the student must: Know: the peculiarities of working with large unstructured and semi-structured data; principles of NoSQL technology; big data processing tools; methods and tools for data analysis; goals and objectives of cloud technologies; prerequisites for migration to the "clouds"; basic concepts, functions and development trends of cloud technologies; types of cloud architectures; the main benefits and risks associated with cloud computing. Be able to: configure and organize NoSQL databases; choose a NoSql DBMS for solving an applied problem; use NoSQL databases in IS projects; identify automated business processes that are more efficient to move to the "clouds"; assess the possible risks of using cloud technologies; choose the best strategy for the transition to cloud technologies. Have skills: Demonstrate proficiency in data manipulation technologies and languages; big data analysis tools using distributed systems and modern query languages; methods for assessing the cost of software systems in the "clouds"; methods of developing a company's exit strategy for using cloud technologies. Competences: independently apply modern computer technologies to solve research and production-technological problems of professional activity; demonstrate basic knowledge in the field of mathematics and natural sciences, their use in professional activities; demonstrate mastery of techniques and methods of operation of modern computers and equipment; apply methods and means of protecting information infrastructure, information resources and technologies; determine the requirements for the design of the network architecture, software and hardware of the computer network; develop, adapt and implement high-load applications; develop the infrastructure of information systems, including databases, operating systems, application software, etc.; prepare technical documentation for the design of information systems and software development.