«ALIKHAN BOKEIKHAN UNIVERSITY»

MODULAR EDUCATIONAL PROGRAM
7M06110 «INFORMATICS»

Semey, 2023

Developed by the Department of "Information and Technical Sciences"

Discussed and approved at the meeting of the Department of "Information and Technical Sciences"
(Protocol No. 05 of 15.05.2023).

Reviewed and recommended for approval at the meeting
Academic Quality Council of the Faculty
(Protocol No. 05 of 20.05.2023).

Reviewed and approved at the meeting of the Educational and Methodological Council of the University
(Protocol No. 05 of 25.05.2023).

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1. Explanatory note

The modular educational program is based on the following regulatory documents:

I. Regulatory documents of the Republic of Kazakhstan:

1. The Law of the Republic of Kazakhstan «On Education» dated 27.07.2007 with additions and amendments dated 21.02.19;
2. The State standard of higher and Postgraduate education, approved by the Order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 2 dated July 20, 2022;
3. Rules for the organization of the educational process on credit technology of education, approved by Order of the Minister of Education and Science of the Republic of Kazakhstan No. 152 dated April 20, 2011 (as amended by Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 563 dated 12.10.2018);
4. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 595 dated 30.10.2018;
5. Professional standard «Teacher», approved by the Order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan «Atameken» No. 500 dated December 15, 2022.

II. Regulatory documents of the Educational Institution «Alikhan Bokeikhan University»:

1. MR. Revision No. 4 of 05.10.2022 «The structure of the modular educational program»;
2. Item Revision No. 4 of 23.08.22 «Regulations on the research work of undergraduates».

The MEP is designed as a set of sequential training modules for the entire period of study and is aimed at mastering the competencies necessary for awarding the academic degree of Master of Technical Sciences in the educational program 7M06110 - Informatics.

The block of basic disciplines (BD) consists of 35 credits, of which the disciplines of the university component (UC) - 20 credits, including pedagogical practice – 3 credits; disciplines of elective components (CC) - 15 credits.

The block of profile disciplines (MD) consists of 53 credits, from the disciplines of the university component (UC) - 21 credits (including research practice – 13 credits) and the disciplines of the elective components (CC) - 32 credits.

Research work of a master's student, including internship and completion of a master's thesis – 24 credits.

The final state certification is 8 credits, including the preparation of a master's thesis (6 credits) and the defense of a master's thesis (2 credits).

The criterion for the completion of the educational process is the development of 120 credits by undergraduates, of which 88 credits of theoretical training. The MEP consists of 11 modules, including all types of training (all practices and research) and the final state certification.

When updating the educational program 7M06110 «Informatics», the Department of Information and Technical Sciences annually conducts seminars with social partners to discuss the modular educational program, social partners share their opinions and suggestions during the discussion. Social partners of various institutions participate in the development and discussion of the modular educational program 7M06110 «Informatics», Acting associate Professor of the Department of the NGO «Semey Medical University» Musataeva I.S.; Managing Director of the branch of JSC «Transtelecom» Seilkhanov A.D.; Associate Professor of the Department of «Automation and Information Technologies» of the Shakarim State University, Semey Zolotov A.D.; Vice-Rector for Academic Affairs of the Sofia Technical University, Professor Stanyo Kolev.

The purpose of the modular educational program is to train highly qualified masters with in-depth scientific and pedagogical knowledge of object-oriented analysis and design technologies, Big Data, Smart technologies, cryptographic protection of information, intelligent information systems, who possess the basics of research and experimental methods of observation and analysis of information processes and phenomena.

After successful completion of the educational program (EP) 7M06110 «Informatics», the master will be able to:

- (**ON1**) analyze the main stages and patterns of historical and scientific development of Kazakhstan and world society to form their civic position; use methodological tools of philosophy for the design of complex, including interdisciplinary scientific research.
- (**ON2**) Demonstrate proficiency in the methodology of software design technology for solving professional tasks, use practical skills in software design and management.
- (**ON3**) to design and carry out comprehensive research based on a holistic systematic scientific worldview using knowledge in the field of history and philosophy of science.
- (**ON4**) freely use Russian and foreign languages for scientific communication, comparative analysis and design of scientific and technical research; perceive and analyze scientific articles in foreign journals and reports at international conferences.
- (**ON5**) conduct psychological and pedagogical research to evaluate and develop new knowledge and integrate knowledge from various fields; apply in practice knowledge of pedagogy, theory and methods of teaching special disciplines.
- (**ON6**) to carry out teaching activities of higher education with the use of innovative technologies; to plan and solve problems of their own professional and personal development; to manage the educational process in universities; to design the educational process and the process of professional training of specialists.

- (**ON7**) to design, predict and construct pedagogical technologies in professional pedagogical activity; to apply pedagogical technologies in the pedagogical process of a modern school.
- (**ON8**) Describe the basic concepts of algorithmization and programming, demonstrate the skills of developing effective algorithms in the interests of applied fields, demonstrate practical skills and abilities to create algorithms for solving problems and their programs.
- (**ON9**) to determine and formulate one's own position based on the objectivity of theoretical assumptions and experimental data arising in the course of research activities and requiring in-depth professional knowledge; to determine promising areas of scientific research in the subject area of professional activity, the composition of research papers, their determining factors.
- (**ON10**) analyze the methods of storing large amounts of data, the stages of the life cycle of big data processing, the languages best suited for processing and analyzing big data, ways of organizing storage and access to big data.
- (**ON11**) to use new knowledge and skills in practical activities, including in new areas of knowledge that are not directly related to the field of activity, taking into account the basic requirements of information security.
- (**ON12**) analyze and comprehend the realities of modern theory and practice on the basis of technical knowledge and the results obtained and make generalization, assimilation of basic concepts and methods, classify algorithms for solving formulated problems, analyze the results obtained.
- (**ON13**) Apply data analysis elements and interpret the results, distinguish the characteristics of SQL and NoSQL databases, formulate algorithms in the MapReduce paradigm, choose a suitable big data analysis tool, and big data storage technology.
- (**ON14**) use mathematical methods of data analysis, languages and computer processing methods, possess existing methods and algorithms for solving data processing problems.
- (**ON15**) possess the conceptual apparatus of professional ethics of a specialist; methodological approaches to the choice of theoretical tools appropriate to the task being solved; culture of communication in professional and everyday life, skills of public speech, argumentation, discussion.

2. The graduate's competence model

The master's competencies, i.e. his ability to apply knowledge, skills and personal qualities in accordance with the tasks of professional activity, are determined by the learning outcomes formed in the learning process until the successful completion of the educational program «7M06110 – Informatics». In general, the master's competencies are divided into research, pedagogical and professional competencies.

A graduate who has mastered the Master's degree program must have the following competencies:

Research competencies:

- The ability to develop and select methods and tools for conducting research, including the definition of research questions and hypotheses.
- Skills of searching, analyzing and synthesizing scientific sources to support research.
- Ability to collect, analyze and interpret data using statistical methods and tools.
- Knowledge of the principles of planning and conducting experiments, as well as processing the results obtained.
- Skills in writing scientific articles, dissertations, abstracts and other academic texts.

Pedagogical competencies:

- the ability to improve their professional activities in the field of computer science and science, prospects and trends in the development of information technology;
- the ability to communicate orally and in writing in a foreign and state language of the Republic of Kazakhstan to solve the tasks of professional activity; to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences.

– the ability to independently conduct lectures, seminars, practical classes and laboratory workshops using modern educational technologies; plan and organize the independent work of students;

– the ability to observe pedagogical tact, the rules of pedagogical ethics; to show respect for the personality of students; to adhere to a democratic style in relations with students; to show commitment to the highest social values, to the ideas of humanistic pedagogy; to be attached to the system of universal and national values in their unity; to build the educational process taking into account the national priorities of Kazakhstan;

– the ability to develop UMK of the disciplines read; author's courses in accordance with the mission and goals of the organization of education.

Professional competencies:

- ability to plan, organize and conduct scientific research in the field of computer science; conduct correct processing of experimental results with their further presentation in the form of scientific reports, reports, publications and presentations; substantiation of conclusions and conclusions.

- ability to understand the skills of using computer technology, programming tools for the effective implementation of hardware and software complexes and possession of practical skills of object-oriented analysis, design and programming;

- possess knowledge of regulatory and legal documents in the field of IT technology, instructional documentation, skills and abilities to develop current technical documentation of a software product and system, possess organizational skills, show high performance discipline;

Table 1. The sequence of mastering disciplines in the process of forming special competencies

№	Competence	The list of compulsories, elective disciplines and their subsequent study on each trajectory of learning		Expected results
		List of disciplines	Semester	
1	professional competences	Technology software development	1	to know: methods and algorithms of object-oriented programming, methods, languages and standards of information support of products (CALS-technologies) at various stages of their life cycle; be able to: use standard software products focused on solving scientific, design and technological tasks, work effectively as a member of a software development team , possess: methods of collecting, processing and presenting scientific and technical materials based on research results for publication in print, as well as in the form of images, abstracts, reports.
2	Research competencies professional competence	Methodological foundations of scientific research and experimental planning in computer science	1	Know the basics of the methodology of research (methodology of research, methodology of research activities) as a study of organization of research activities; the peculiars and teachings of modern education in the professional sphere; projecting, organization, evaluation and correction of experimental and research activities at different stages; to determine the future directions of research in the subject field of professional activity, the

				composition of the research work, determines their factors - to raise the logo of empirical experimental research, collecting, processing and interpretation of the data received at the meeting for their own research material; select the necessary research approaches, modifie a valid invention from the tasks of a concrete study, explain the results of the experimental study; form its own position, is justified on the objectivity of theorical sites and experimental data; To study the results, analyse and inspect them with the account of existing data, use the awareness of the ethnic norms when assessing their professional activity. to include: terminology of research; modern research methodologies in the subject field; formation of the hypothesis, undertake the necessary methods of research; collecting, manufacturing and interpretation of the received data; issues of review and critical analysis of information.
3	Research competencies professional competence	Basic research	1	Know: the main logical methods and intake of research, Methodological theories and principles of modern education, the basics of modern computer technologies, the criteria for determining the criteria of the data, the criteria of parameters, the principles of choosing the MEPt powerful criteria. to implement methodological support for research, to assess the effectiveness of research activities, to use supporting technologies and multimedia in education and science; Select criteria parameters based on the requirements for quality of products and products, stylize the task of the study, develop from the needs of the production, specify the distribution function, provide parameters of the criterion. add: login-methodological analysis of the research and its results, implementation of mathematical methods in technical additions, the implementation of patent edicts, planning of a research experiment, the introduction of public solutions, arguments, discussions, discussions, and areas of cooperation and negotiation.
4	Research competencies	Academic writing for IT-professionals	2	know: the goals and objectives of analytical text processing in the modern information space, characteristics of an abstract, abstract, analytical review, scientific communication, principles of communicative organization of an abstract and abstract, rules for writing reviews; be able to: conduct a stylistic analysis of scientific, scientific-technical and

				popular science texts, determine the stylistic and genre affiliation of a text in the field of professional information, conduct a semantic analysis of the text and highlight its key words; determine the means of speech expression; convey the content of texts in the form of annotations, abstracts, reviews; skills: techniques of semantic text analysis, methods of communicative text analysis, annotation and abstract genres.
5	Pedagogical competencies	Technologies of teaching specialty disciplines	2	Know: the main regulatory and legal documents on higher education in the Republic of Kazakhstan, the main methodological and technological applications of teaching in the world; to develop thematic and clear plans, develop a dietary material for the harvest; to participate: the process of learning information and discipline of the computer cycle, development of laboratory and practical work on disciplines, use and development of modern teaching and teaching information. it is competent: in providing computer and technological support activities for students in the training process and internal work; in modern information and communication technologies for the creation, formation and administration of electronic educational resources; in order to assess the quality of electronic educational resources and software and technological support for their introduction in the educational process.
6	Pedagogical competencies	Information technologies in teaching	2	Know: the theorical basis of culture and peculiarity of its functionality in the professional activity of a teacher in the field of information technology in education; psychological peculiarties of human information. to analyse and provide information in the logic of traditional forms of science in the field of information technology in education; Use thetheory to solve current problems and tasks in the field of information technology in education. influence: the theory of the orynthology as a way to distinguish action and practical activity in the field of information technology in education; developing their own skills, corresponding requirements for human culture in the field of information technology in education.
7	professional competence	Algorithms and their complexity	2	Know: develop algorithms for concrete tasks; to work with algorithms; to: the main models of algorithms, the methodology for developing algorithms, the ability to work with algorithms; About the algorithms of corrective algorithms for typical mass problems, on the way to solving

				unsolved mass tasks.
8	professional competence	Estimation of the complexity of algorithms	2	Know: the full data of the object (the initial state of the object); the purpose of the algorithm (the end state of the object); the system of the executive team (there is a team that the executor understands and can perform), the overall decision of the big class of recursive stamps; to use algorithms development methodology; carry out a dynamic program, looking for a return; use local scavenging algorithms; Own: the use and use of effective algorithms of the program.
9	professional competence	Technology of object-oriented analysis and design	2	know the evolution and short characteristics of the basic approaches to the development of information models of business systems and business processes; to develop graphical notes and specifications of its use in the process of creating scalable software systems the analysis of the requirement for automated information system.
10	professional competence	Analysis of requirements for automated information systems	2	know: understand and use automated information systems; the basics of designing software systems, testing principles of program provision; to: practically use modern software provision of modern calculating machinery; and the analysis of the requirement for automated information system.
11	professional competence	Cryptographic Information Protection	2	know: understand and use automated information systems; the basics of designing software systems, testing principles of program provision; to use the main cryptographic information; mathematical models of textures; know about cryptoanalysis models of ciphers; about the administration of the keys. To create crypto-suffocating algorithms of encryption and protocols of data transfers.
12	professional competence	Information security technologies	2	know: the structure of cryptographic information; Matametiya model of textures and ciphers; cryptoanalysis models of ciphers, the administration of keys; use basic cryptographic alchemy, protocols and algorithms; use basic cryptographic methodologies, protocols and algorithms; Development of effective encryption algorithms. and the structure of cryptographic information; mathematical models of textures and ciphers; to include: about cryptoanalysis models of the cipher; about the administration of the keys.

13	Pedagogical competencies	Modern pedagogical technologies	3	To know: the concept of pedagogical technology, its structure, the methodology of pedagogical technology and the peculiarities of the use of pedagogical technology in the educational process. Be able to: design, predict and construct pedagogical technologies in professional pedagogical activity; apply pedagogical technologies in the pedagogical process of a modern school. Skills: creative use of new technologies in professional activity
14	Pedagogical competencies	Pedagogical ethics of a modern teacher	3	Know: historical aspects of the development of etiquette as a human being; thetheorical basis of the etiquette, its understandable and categorical apparatus; To use ethnic norms and standards in professional practical activities; to be self-oriented in these issues and in the way they are cut; To implement the norms of public morale and the requirements of professional etiquette in practical activities. Training: to have a professional etiquette apparatus of a professional; Methodological approaches to the choice of the theoretic instrument, corresponding to the task; culture of culture in professional and public life, public decisions, arguments, vedenia discourse.
15	professional competence	Intelligent information systems and technologies	3	to know: the theory of modern information technologies; methods, methods and means of obtaining, storing and processing information. be able to: apply information technologies in solving problems; use sources of economic, social, and managerial information. possess: information technology skills; modern methods of collecting, processing and analyzing economic and social data.
16	professional competence	Smart technologies in education	3	know: understand information technologies and programming; the overall development principles of the program; understand the life cycle of the information system; characteristics of the main processes of IS; Model LTD; the peculiarity of analysis and proscription; to carry out a methodological analysis and design of the SASE technology system; work with different types of diagrams; work with elements of graphic notes; and the development of multimedia software, the use of different technologies in the development of multimedia funds.

17	professional competence	Modern project management technologies	3	Know: the tasks of the project manager for all phases of the iterative and incremental development cycle, the use of PERT-analysis for the time and budget of the project, the typical costs of IT projects, ihklassification, strategy of management, control over the implementation of the project; to form a plan of work (a set diagram of the work), to assess the labor rate and determine the budget of the project, to determine the implementation period of the PERT project method, Analysis of risks;contributeto: iterative-increment model of development cycle, planning and critical project management, management of risk management in IT projects, financial support of projects, reduced cost and training, project configuration management.
18	professional competence	Project management methods	3	Know the modern methodology of project, determination and interpretation of projects, programs and their context as objects of administration; the preposition and the comprehension of subjects of administration and the use of tools; the history and tendency of the development of projects; determine the objectives of the subject region and the structure of the project; Technical self-sustaining administration of non-negotiable projects; to participate in the work of the team in complex projects effectively.
19	professional competence	Big Data Technologies	3	Know: Analysis and analysis of the MEPt common data, stages the life cycle of the processing of big data, languages, the MEPt readily available for processing and analytics of big data, as well as the organization of heritage and access to great data; to perform elements of data analysis and interpretation of results, differentiate the characteristics of SQL and NoSql BD, formulate algorithms in MapReduce paradigm, select the approaching tool for analyzing big data, choose the approaching technology of memory of big data.; Own: Analysis of data, languages and computer methods of processing.
20	professional competence	Data processing and storage technologies	3	Know: IT architecture of modern enterprises as part of the system, ensuring the printing and processing of big volumes of data, the ability of algorithms and applications to work with highly segregated services. To use modern systems of relocation. The aim is to analyse the architecture of modern enterprises and the centers of processing data, to develop protocols and technologies for the construction of virtual infrastructure of

				enterprises. and the development of highly developed services. The receipt of the works with modern applications of big data.
21	professional competence	Interfaces of software systems	3	Know the peculiars of the price. Engineering, psychological and ergonomic projecting of human-machine systems; The public design ingenuity of interfaces of human interaction is a significant part, to form requirements for hardware and software, providing the operator with a reasonable amount; To make a choice and provide project resolutions for the organization of computer interfaces.
22	professional competence	The life cycle of the software	3	know the PC po; the way of use of the LC PO; principles and technology of the program cycle; to work with the PCs; use HC on solving tasks; to produce the program cycle section, To develop automated systems for processing information, databases of the stage and stages of development of the program, as well as to perform testing of the software.

Table 2. Sequence of mastering educational programs of social and professional interaction

Course	Ensuring discipline	Competence	Expected results
Basic Disciplines (BD)			
1	History and philosophy of science	Research competencies	**Tags:** - structures and the principles of education, its organization and functionality; - the problem of the genetics of the world with its history, floating models and types of corn; - the possibility of cooperation of scholarly and philosophic thoughts; - basic thoughts of history and philosophy of the scientific; - the problem of formation of consciousness, laws of formation and development of disciplines; - the main principles of research activity. **Ability:** - Formulate and solve tasks, increase in research activities and the needs of the in-house professional know-how; - To select the necessary research approaches, to improve the quality of the new and develop new approaches; - to analyse and understand the reality of modern theory and practice on the basis of history and philosophy, methodology of natural, social, humanitarian and technical knowledge; "Use methodological and practical knowledge in research, teaching and educational work. **Training:** - new educational and pedagogical activities, the need edging of the fundamental syllability of the relevant direction; - the synthesis of articles, thesis; speeches at conferences, symposia, round table discussions and exchanges of ideas.
1	Foreign languages (professional)	professional competence	**Tags:** **- functional** and stylistic characteristics of the material in foreign languages; "The terminology and terminology of the terminology are relevant in the foreign language. **Ability:**

			- Read freely the information of the relevant department in the foreign language with the following analysis, interpretation and information; - expend in a written form (abstract, annotation, resume) scientific information; - participate in the professional discourse, academic debates, presentations, bets for round table; - to present presentations of scientific research (at seminars, conferences, symposia, forums); "To raise awareness and understand public speech espousing communication (lectures, speeches, TV and Internet programs). **Training:** - a private collection in monologue and dialogue form in specialty (report, report, presentation, five round table, discussion, debates, pronunciation); - written scholarly approach to the field (scholarly article, thesis, report, processing, reference and annotation); - works with lexicographic sources in foreign languages; "The use of modern approaches to the development of foreign languages.
1	Pedagogy of higher education	Pedagogical competencies	**Tags:** modern paradigm of higher education, history of pedagogical science in the history of the development of higher education in Kazakhstan and modern experience in educational activity. **Ability:** to define the main provisions of managerial activities and managerial relationships, Use methods of organizing the learning process on the basis of the credit system of training in high school, creative thoughts and creative approaches to solving pedagogical situations. **Training:** the development of methodological approaches to the choice of theoretic instruments, culture and culture in professional and public life.

2	Management psychology	professional competences	**Tags:** about the sustenance and structure of the managerial process, thetheorical basis of the psychology of the administration and its understandable and categorical apparatus, peculiarity of personality as an object and subject. **Ability:** apply managerial skills to work with groups and groups, to provide communication between groups and for them, to use psychological help and motivation in the group. **Training**: the management of the psychological apparatus, the delegation of power and time management.
2	Pedagogical practice	Pedagogical competencies	To know: the pedagogy of higher education, the structure and regulatory documentation of the institution of vocational education; to be guided in the theoretical foundations of the science of the taught subject; the features of the educational process at the university. Be able to didactically transform the results of modern scientific research in order to use them in the educational process; independently design, implement, evaluate and adjust the educational process; use modern innovations in the process of vocational training; Skills: to master the methods of self-organization of activity and improvement of the teacher's personality; to build relationships with colleagues, to find, to possess the skills of practical use of knowledge of the basics of pedagogical activity in teaching a history course, to make and implement managerial decisions in their scientific and pedagogical practice; to master conducting various types of classes with students in the academic discipline assigned to him; to master the culture of speech, communication.
Profile disciplines (PD)			
4	Research practice	Research competencies	To know: in-depth theoretical and practical knowledge of professional activity; to acquire and use in practice new knowledge and skills, the ability to use the idea of the methodological foundations of scientific knowledge, the role of scientific information in the development of science; Be able to: conduct bibliographic work with the involvement of modern information technologies, analyze scientific information; classify the main universal concepts used in the methodology of historical science, the main directions of modern theoretical and methodological research, analyze the scientific essence of problems

			arising in the course of professional activity; the ability and willingness to apply modern research methods, conduct scientific research, evaluate the results of the work performed; Skills: to use modern achievements of historical science and advanced technology in scientific research; to plan and set research objectives, to choose research methods, to structure methods of historical research, to operate with terminology, categorical apparatus, to understand and generalize modern scientific literature written from various theoretical and methodological positions, to interpret and present the results of scientific research, willingness to present research results in the form of scientific publications.
Research work(RW)			
1,2,3, 4	Research work of undergraduates, including internship and master's thesis (RW)	Research competencies	To know: a systematic understanding of the field of study, various theoretical concepts in the field of research and draw conclusions; new scientific ideas, communicate their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge; Be able to: organize, plan and implement the process of scientific research; analyze, conduct independent scientific research, adapt modern theoretical and methodological concepts to solve a specific scientific and historical problem, interpret and explain the main theoretical and methodological schools and trends, models characterized by academic integrity, based on modern theories and methods of analysis; choose and effectively use modern research methodology; Skills: possess the basic skills of planning, forecasting, coordinating and implementing the processes of research work on the topic of a dissertation, scientific internship, comprehend and evaluate the latest achievements of historical science, preparation of scientific publications on the topic of research, writing a doctoral dissertation, research of scientific writing and scientific communication; a systematic understanding of the field of study and demonstrate the quality and effectiveness of selected scientific methods;

1. List of modules included in the educational program

№ module	Name of the module	Name of disciplines	Block	Semestr	The volume of credits for the discipline	Form of control	Total credits by module
M.1	History and philosophy of science	History and philosophy of science	BD UC	1	5	Exam	8
		Academic writing for IT-professionals	MD UC	2	3	Exam	
M.2	Foreign language	Foreign language (professional)	BD UC	1	4	Exam	4
M.3	Pedagogy	Pedagogy of higher education	BD UC	1	4	Exam	7
		Pedagogical practice	BD UC	2	3	Report	
M.4	Psychology	Management Psychology	BD UC	2	4	Exam	4
M.5	Automation of software and research works	Methodological foundations of scientific research and experimental planning in computer science/Basic research	BD CC	1	5	Exam	10
		Technologies of teaching specialty disciplines/Information technologies in teaching	BD CC	2	5	Exam	
M.6	Analysis and design technology	Technology software development	MD UC	1	5	Exam	10
		Modern pedagogical technologies/Pedagogical ethics of a modern teacher	BD CC	3	5	Exam	
M.7	Research work	Research practice	MD UC	4	13		37
		Research work of undergraduates, including internship and master's thesis	RW	1,2,3, 4	24	DIF/z Report	
M.8	Algorithms and programming	Algorithms and their complexity/Estimation of the complexity of algorithms	MD CC	2	4	Exam	8
		Technology of object-oriented analysis and design/Analysis of requirements for automated information systems	MD CC	2	4	Exam	
M.9	Design and project management technology	Cryptographic Information Protection/Information security technologies	MD CC	2	4	Exam	14
		Intelligent information systems and technologies/ Smart technologies in education	MD CC	3	5	Exam	
		Modern project management technologies/Project management vethods	MD CC	3	5	Exam	

M.10	Interfaces and Big Data Technologies	Big Data Technologies/Data processing and storage technologies	MD CC	3	5	Exam	10
		Interfaces of software systems/The life cycle of the software	MD CC	3	5	Exam	
M.11	Final state certification	Preparation of a master's thesis	FA	4	6		8
		Defense of the master's thesis	FA	4	2	Protection	
	Total				**120**		**120**