APPROVED
at a meeting of the
Scientific Council
NJSC «Al-Farabi KazNU».
Minutes No.10 dated
May 13, 2023.

The program of the entrance exam for applicants to the PhD for the group of educational programs D012 – «Teacher training in informatics»

1. General provisions.

1. The program was drawn up in accordance with the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 600 "On Approval of the Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Higher and Postgraduate Education" (hereinafter referred to as the Model Rules).
2. The entrance exam for doctoral studies consists of writing an essay, passing a test for readiness for doctoral studies (hereinafter referred to as TRDS), an exam in the profile of a group of educational programs and an interview.

Block	Points
1. Essay	10
2. Test for readiness for doctoral studies	30
3. Exam according to the profile of the group of the educational program	40
4. Interview	20
Total admission score	100/75

3. The duration of the entrance exam is 4 hours, during which the applicant writes an essay, passes a test for readiness for doctoral studies, and answers an electronic examination. The interview is conducted on the basis of the university before the entrance exam.

2. Procedure for the entrance examination.

1. Applicants for doctoral studies in the group of educational programs D012 - «Teacher training in informatics» write a motivational essay. The volume of the essay is at least 250-300 words.
2. The electronic examination card consists of 3 questions.

Topics for exam preparation according to the profile of the group of the educational program.

Discipline «Informatization of education»

Introduction to informatization of educationThe concept of informatization. The purpose and objectives of the informatization process. Factors influencing the informatization process. The main directions of informatization of society. Stages of development of informatization of society. Positive and negative aspects of informatization of society.The concept of informatization of education. Factors influencing the informatization of education. Informatization of education and life of society. The main directions of informatization of education. Stages of development of informatization of education.The purpose and objectives of informatization of education. Place of informatization of education. Formation of informatization of education in the Republic of Kazakhstan and abroad.Influence of informatization on the methodological system of education. Pedagogical capabilities of a modern computer, information and communication technologies. Psychological and pedagogical foundations of informatization of education. Psychological and pedagogical theories underlying computerization and informatization of education. The concept of information culture. Components of information culture.An informational approach to building a learning model. Informatization of education as a direction of scientific research, scientific and pedagogical and scientific and methodological research. Informatization of education as a direction of training teachers.Information educational environment and information educational spaceThe concept of an information educational environment and its components. Features of training in an information educational environment.Information educational space and its components. Features of training in the information educational space. Information educational space as a system of information educational environments.Technologies and means of informatization of educationThe concept of technology of informatization of education. Classification of technologies of informatization of education.Information Technology. Telecommunication technologies.Information technologies for input and output of information, storage and presentation of information transfer. Hypertext and hypermedia technologies. Multimedia technologies. Intranet / Internet / Extranet technologies in education. Distance learning technologies. Information Modeling Technology and Virtual Reality.Personally-oriented technologies of informatization of education. Information and developmental technologies of informatization of education.Methods of informatization in teaching. Method of projects. Telecommunication project method. Information resource method. Teleconference method. Intranet / Internet / Extranet Techniques. Information Modeling Method.Penetration of informatization methods into student-centered learning, developmental learning.Factors affecting the rationale and choice of technology and methods of informatization.Methods of informatization of educational activitiesInformation and telecommunication technologies in the educational process. Informatization of control and measurement of learning outcomes. Informatization of extracurricular activities, scientific and methodological research.Methods of informatization of organizational and management activities. Calculation, planning and administration of educational activities in the context of the informatization of education. Application of Intranet / Internet / Extranet technologies in the management of an educational organization.Means of informatization of educationThe concept of means of informatization of education and their classification.Technical means of informatization of education. Technical base and basic basic means of informatization of education. Stages of introducing technical means of informatization into education. Classification of technical means of informatization of education.Telecommunication facilities and their classification. Multimedia tools. Organization of Intranet / Internet / Extranet networks in education. Organization of distance learning, open education and virtual institutions. Means of organizing interpersonal communication. Means of informatization of control and measurement of learning outcomes.Computer software and methodological support and its classification.The concept of world information resources and their classification. The concept of educational information resources and their classification. Educational portals. Resources for distance learning, open education and virtual institutions. Resources for organizing interpersonal communication. Social networks.Information resources for monitoring and measuring learning outcomes. Information resources of extracurricular activities. Resources for scientific and

methodological research.Organizational and managerial resources. Opportunities of Intranet / Internet / Extranet technologies in the management of educational information resources. Use of "clouds" and data centers.Factors affecting the rationale and choice of technical means of informatization of education and information educational resources.The concept of electronic edition and their classification. The concept of an educational electronic edition and their classification. Components of educational electronic edition. Areas of use of educational electronic publications and resources.Approaches to the presentation of the content of educational electronic publications and resources. Tools for creating educational electronic publications and resources. Stages of design and development of educational electronic publications. The interface of the educational electronic edition and its classification. Assessment of the quality of an educational electronic publication and resource.Training of teachers in the context of informatization of educationCompetencies for teachers in the context of the informatization of education. Factors of the formation of teachers' readiness to use technologies, methods and means of informatization of education. The system of training teachers in the field of informatization of education.

Discipline «Learning Problems»

Representation and coding of information using sign systems. Number systems and computer presentation of information. Information coding methods. Language as a form of information presentation (natural and formal languages). The main logical nodes of the computer: encryptors, decoder, adder, multiplexers and demultiplexers. Graphical representation of logical nodes and their truth tables. Methods for studying logical elements using the example of bit strings (based on an example of 8-bit).Stages and trends in the development of technical means and information resources. The architecture of modern computers. Basic computer devices: functions and modular-backbone principle of building a computer. The main directions and states of studying the architecture of modern computers in universities.Basic concepts of information technology. Historical preconditions for the development of information technology. Methodology of using information technologies in the educational process.The main directions of software development for modern computers. Software classification. Variety of operating systems. Server operating systems. Problems of introducing modern software into the educational process.Definition and structure of computer networks. Prospects for the development of local and global computer networks. Advantages and disadvantages of types of network topologies. Problems speeding up the loading of web pages and saving trafficA set of hardware and software for organizing computer networks. Internet addressing system. Client-server architecture. The main services of the Internet: e-mail, chat, teleconferences, forums and methods of their use in the educational process. Competition as a factor in the development of information retrieval systems. Methodology and stages of introducing computer networks into the educational process.Characteristics of probabilistic and alphabetical approaches to the measurement of information. Information transfer rate. Data transmission medium. Methods for increasing the bandwidth of the communication channel.Wireless technologies and the main directions of their development. Problems and prospects for the development of network technologies, hardware, protocols, operating systems and their use in the educational process of the university. Educational network systems.Scientific and theoretical foundations of the use of educational Internet resources. The effectiveness of using hypertext technologies in education. Website creation technology. The use of these technologies and methods of their study in the educational process.Database. Modern database management systems. Data organization models. Relational data models. The integrity of relational data. Keys. Primary keys. Foreign keys. Generic keys. Methods for their study.Relational data models. Relational data objects. Subject area. Relations. Relationship diagram. The concept of "entity-relationship". Projection. Attribute. Functional dependency between attributes. Domain. Tuple. Examples of using relational data models in the educational process and methods of teaching them. Relational data models. Relational algebra. Basic operators of relational algebra. Computer implementation of relational algebra.Database. Triggers: Create and Apply. Trigger definition. Implementation of triggers and examples of use in the management of the educational process. Database. Transactions. Creation and deletion of a transaction. Transaction management. An example of using a transaction in managing the educational process.Intelligent systems. The main directions of intelligent systems and their teaching

in the educational process of the university. The structure of intelligent systems. Design and computer implementation of an intelligent system.Expert systems. The main advantage and purpose of expert systems. Areas of application of expert systems. Knowledge base of expert systems. Educational expert systems.Algorithmization and programming basics. Algorithms. Data types. Physical implementation of data types in a computer system. Structures. Computer implementation of structures. Operators. The methods of their operators. Linear programming. Non-linear programming. Dynamic programming. Methods of their study in the educational process of the university.Computer modelling. Modeling of processes. The main stages of computer modeling.Informational resources. Educational information resources. Information ethics and law, information security. Protection of information. Legal and pedagogical aspects of the implementation of information security.Information Security. Security threats, methods and means of information protection. Computer viruses: definition and classification. Protection against computer viruses. The legal and pedagogical state of the teaching of computer viruses. Cryptographic protection methods. History of cryptography. Basic concepts and definitions. Requirements for cryptographic systems. Encryption algorithms. Methods for their study.Educational robots. The basics of introducing robotic tools into education. Types of educational robots. Educational robot software. The introduction of robots into the educational process of schools and universities.Distributed data. The main tasks of distributed data management systems. The use of distributed data in education.Open systems concept. Clients and servers of local area networks. Client-server system architecture. Database servers. Database clients. The use of this technology in the organization of the educational process. Grid technologies. Basic concepts. Grid concept. Possibilities of grid technologies. Types of grid systems. Problems of the introduction of grid technology in the educational process.Cloud fundamentals. Cloud computing as a new way to deliver computing resources. Cloud structures. Types of clouds. The use of cloud technology resources in education.Parallel computing. Basic concepts of parallel computing. Parallel computing implementation environment. Promising areas of high-speed computing. The state of the study of parallel computing in the educational process of the university.Basic concepts of supercomputers. The history of the formation of supercomputers. State of use in the educational process.

Discipline «Programming languages»

Object Oriented Programming.Data type.Main components: Class of components. Class constructor. Operation New. Static class membersData transformation. Grouping of operators. Real estate operator. Stop the operator. Interrupt operator. Continue operator. Completion operator. Return operator. Jump operator. The operator of the contract. Operation priorities.Subprocesses: class of threads, synchronization of subprocesses.Operators: loop operator. Loop stop operator. Selection operatorArrays: an array and its characteristics. Methods for declaring a static array.Arrays: Methods for working with dynamic arrays and declaring arrays for placement. Input and output of arrays.Functions: internal and external functions. Data type. Actual and formal variables.General characteristics of programming languages.Types and data structures.Algorithms. Algorithms and programming languages.Basic constructions of modern programming languages.Methods, technologies and programming tools.Functions and methods.Procedural, logical, functional and object-oriented programmingMethods for efficient storage and processing of data. Files, databases.Object-oriented programming methodology. Classes and objects object-oriented programming technology.Matrices, vectors. String values. Files. Recursion. Graphs, trees. Combined tasks. Non-combined tasks.

3. List of references

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