

**"Kazakh National Research Technical University after K. I. Satpayev"
Institute of Cybernetics and Information Technology
The department of "Cybersecurity, processing and storage of information"**

**Educational program
CURRICULUMPROGRAM**

**8D06103-«MANAGEMENT INFORMATION SYSTEMS»
PhD-program**

1st Edition
in accordance with the Higher Education 2018 SES

Almaty 2020

Разработано:	Рассмотрено: заседание УС Института	Утверждено: УМС КазНИТУ	Страница 1 из 21
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The program is drawn up and signed by the parties:
by KazNRTU after K. I. Satpayev:


Director of the Institute of Cybernetics and
Information Technology, PhD



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Candidate of Technical Sciences

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3. The Chairman of the educational-methodical group
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Employers:

1. Developer LLP «Solly», Master of Engineering, A. Azhenov

From the university partner:

- 1 International University of Information Technologies
- 2 Almaty University of Energy and Communications
- 3 National Aviation University, Ukraine

Approved at the meeting of Educational and Methodological Council of Kazakh National Research Technical University after K. I. Satpayev. The protocol №3 from 15.12.2020.

Short description of the program:

1. Objectives.

The aim of the educational program is to teach doctoral students basic and specialized disciplines in the field of information systems, to prepare and defend a dissertation with the achievement of relevant competencies.

2. Types of labor activity.

The professional activities of graduates include: science, education, public administration and local self-government, economics and finance, industry, agriculture, culture, healthcare.

3. Objects of professional activity.

The objects of professional activity of graduates of doctoral programs in OP are:

- IT departments and departments of public authorities;
- IT departments and departments of industrial enterprises;
- IT departments and departments of financial organizations;
- information services of scientific institutions;
- information services of public authorities;
- academic institutions .

The main functions of the professional activities of graduates are: design, operation, administration, maintenance, testing, ensuring the operation of information systems for various purposes.

Areas of professional activity are as follows:

- development, implementation and operation of information management systems;
- development, implementation and operation of expert systems;
- development, implementation and operation of information and organizational systems.

PASSPORT OF THE EDUCATIONAL PROGRAM

1. Scope and content of the program

The educational program for the preparation of a Doctor of Philosophy (PhD) has a scientific and pedagogical focus and involves fundamental educational, methodological and research training and in-depth study of disciplines in the relevant areas of science for the system of higher and postgraduate education and the scientific field.

The educational program for the preparation of a doctor in profile requires fundamental educational, methodological and research training and in-depth study of disciplines in the relevant areas of science for the sectors of the national economy, social sphere: education, medicine, law, art, economics, business administration and in the field of national security and military business.

Educational doctoral programs in vocational training are developed on the basis of studying the experience of foreign universities and research centers that implement accredited training programs for PhD doctors or doctors in profile.

The content of the educational program of specialized doctoral studies is established by the university on its own.

The main criterion for completing the educational process for the preparation of Doctors of Philosophy (PhD) (doctorate in profile) is the development by a doctoral student of at least 180 academic loans, including all types of educational and scientific activities.

The term of study in doctoral studies is determined by the amount of spent academic loans. When mastering the established amount of academic loans and achieving the expected learning outcomes for obtaining a Ph.D. or PhD degree, the doctoral education program is considered fully mastered.

Training in doctoral studies is carried out on the basis of educational programs of the magistracy in two areas:

- 1) scientific and pedagogical with a term of study of at least three years;
- 2) profile with a training period of at least three years.

The professional activities of the graduates of the program cover the field of information systems, artificial intelligence, Big Data and Database Design .

The direction of the program of specialty and specializations relates to engineering and engineering .

The aim of the educational program is to teach doctoral students in basic and specialized disciplines, to prepare and defend a dissertation with the achievement of relevant competencies.

In the case of successful completion of the full course of doctoral studies , defense and approval of a scientific dissertation at the Ministry of Education and

Science of the Republic of Kazakhstan, the graduate is awarded the degree of Doctor of Philosophy.

The professional activities of graduates include: science, education, public administration and local self-government, economics and finance, industry, agriculture, culture, healthcare.

The objects of professional activity of graduates of doctoral programs in specialty 6 D 070300 - "Information Systems" are:

- IT departments and departments of public authorities;
- IT departments and departments of industrial enterprises;
- IT departments and departments of financial organizations, etc.
- information services of scientific institutions;
- information services of public authorities;
- academic institutions .

The main functions of the professional activities of graduates are: design, operation, administration, maintenance, testing, hardware and software protection of information systems for various purposes.

Areas of professional activity are as follows:

- development, implementation and operation of information retrieval with Istemi;
- development, implementation and operation of information management systems;
- development, implementation and operation of expert systems;
- development, implementation and operation of information and organizational systems. In the process of mastering the educational program, Dr. PhD in the field of information systems should acquire the following key competencies .

Dr. PhD should:

have an idea:

- on modern methods of building and developing information systems, from the point of view of modern trends, directions and patterns of development of domestic and foreign science in the context of globalization and internationalization ;
- about modern software for research and modeling and for the design of information systems;
- about modern technical means used to build information systems;
- on the key stages of development and the paradigm shift in scientific knowledge; - about the subject, methodological specificity of technical sciences in the field of information systems;
- about are scientific x School of Arts in the field of information systems , their theoretical and practical studies;
- about are scientific s concept s World and Kazakhstan science in the field and information systems

be able to:

- organize, plan and implement a research process; - analyze, evaluate and compare various theoretical concepts in the field of information systems research and draw conclusions; - analyze and process information from various sources; - conduct independent scientific research characterizing academic integrity on the basis of modern theories and methods of analysis; - generate your own new scientific ideas;

- bring their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;

- choose and effectively use modern research methodology; - plan and predict their further professional development - carry out analysis, formulate problem statements, develop mathematical models, conduct modeling to study the functioning of information systems using modern software products;

- conduct analysis, formulate objectives, develop algorithmic and software for information systems;

know:

- current trends, directions and patterns of development of domestic science in the field of information systems in the context of globalization and internationalization;

- methodology of scientific knowledge in the field of information systems;

- achievements of world and Kazakhstani science in the field of information systems;

- modern methods of constructing and analyzing the functioning and information systems in various industries;

- current development trends, forecast estimates of the use of technical means and systems;

- standards, methodological and normative materials accompanying the conduct of research and development, design, commissioning and operation of information systems ;

- modern methods of constructing and analyzing the functioning of information systems in various industries;

- current development trends, forecast estimates of the use of technical means of information systems ;

- standards, methodological and regulatory materials accompanying the conduct of research, design, commissioning and operation of information systems in various industries.

have skills:

- - Analytical and experimental of research work ;

- planning and forecasting research results;

- oratory and public speaking at international scientific meetings, conferences and seminars;

- scientific writing and scientific communication;
- planning, coordination and implementation of the research process;
- with a systematic understanding of the field of study and a demonstration of the effectiveness of the selected qualitative and scientific methods;
- organization and research work in the field of information B with the ;
- collection, storage and processing of information used in the information B with the .

The professional activities of graduates include: science, education, public administration and local government, economics and finance, industry, agriculture, culture, health care.

Doctor of Philosophy 6D070300 - specialty "Information Systems" can provide services to government agencies, industrial enterprises, financial organizations and academic institutions.

The objects of professional activity of graduates are:

- computer services of public authorities;
- computer services of industrial enterprises;
- computer services of financial organizations, etc.
- information services of scientific institutions;
- information services of public authorities;
- academic institutions;

The main functions of the professional activities of graduates are: design, operation, administration, maintenance, testing, hardware and software protection of information systems for various purposes.

Areas of professional activity are as follows:

- development, implementation and operation of information retrieval systems;
- development, implementation and operation of information management systems;
- development, implementation and operation of expert systems;
- development, implementation and operation of information and organizational systems.

Doctor PhD in the field of information systems should solve the following problems in accordance with the types of professional activity.

in the field of organizational and managerial activities:

- be the head of the IT department , department, department ;

in the field of experimental research:

- be the head of a scientific laboratory for conducting theoretical and experimental studies of IT facilities;

in the field of research and educational activities:

- to be a leading researcher or head of a scientific laboratory for the research and development of modern information technologies and systems ;

- to be a teacher of disciplines of undergraduate, graduate and doctoral programs in special disciplines in the field of information systems ;

in the field of design and engineering activities:

- be the head of the department for the development and design of information systems in various industries .

During the training, scientific internships are provided : University Ottawa, Canada ; National Aviation University, Kiev, Ukraine; Faculty of Engineering, University Putra Malasia .

2. Entry Requirements

Persons with a master's degree and at least 1 (one) year work experience or who have completed studies in a residency program are accepted for doctoral studies.

Enrollment in the number of doctoral students is carried out by the selection committees of universities and scientific organizations based on the results of the entrance exam for groups of educational programs for doctoral studies and a certificate confirming knowledge of a foreign language in accordance with the European competencies (standards) of foreign language proficiency.

When enrolling in universities, doctoral students independently choose an educational program from the corresponding group of educational programs.

Enrollment of persons for targeted training of Doctors of Philosophy (PhD) by state educational order is carried out on a competitive basis.

The procedure for admitting citizens to doctoral studies is established in accordance with the "Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Postgraduate Education".

At the “entrance” the doctoral candidate must have all the prerequisites necessary for mastering the corresponding professional curriculum for doctoral studies. The list of required prerequisites is determined by the higher educational institution independently.

In the absence of the necessary prerequisites, the doctoral student is allowed to master them on a paid basis. In this case, doctoral studies begin after the doctoral student has fully mastered prerequisites.

3 Requirements for completing studies and obtaining a diploma

Persons who have mastered the educational doctoral program and defended their doctoral dissertation, if the dissertation councils of the university with special status are positive, or the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan according to the results of the examination, are awarded the degree of Doctor of Philosophy (PhD) or doctor in profile and issued a state diploma with the application (transcript).

Persons who have received a PhD doctorate, in order to deepen scientific knowledge, solve scientific and applied problems on a specialized topic, carry out a post-doctoral program or conduct research under the guidance of a leading scientist of the chosen university.

3.1 Requirements for the key competencies of doctoral graduates:

1) *have an idea:*

- about the main stages of development and paradigm shift in the evolution of science;
- On the subject, worldview and methodological specifics of the natural (social, humanitarian, economic) sciences;
- about scientific schools of the corresponding branch of knowledge, their theoretical and practical developments;
- On the scientific concepts of world and Kazakhstani science in the relevant field;
- on the mechanism for introducing scientific developments into practical activities;
- on the norms of interaction in the scientific community;
- About the pedagogical and scientific ethics of a scientist-researcher;

2) *know and understand:*

- current trends, directions and patterns of development of domestic science in the context of globalization and internationalization;
- methodology of scientific knowledge;
- achievements of world and Kazakhstani science in the relevant field;
- (recognize and accept) the social responsibility of science and education;
- perfect foreign language for the implementation of scientific communication and international cooperation;

3) *be able to:*

- organize, plan and implement a research process;
- analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
- analyze and process information from various sources;
- conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;
- generate their own new scientific ideas, communicate their knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
- choose and effectively use modern research methodology;
- plan and predict their further professional development;

4) *have skills:*

- critical analysis, evaluation and comparison of various scientific theories and ideas;
- analytical and experimental scientific activity;
- planning and forecasting research results;
- oratory and public speaking at international scientific forums, conferences and seminars;
- scientific writing and scientific communication;
- Planning, coordination and implementation of research processes;
- a systematic understanding of the field of study and demonstrate the quality and effectiveness of selected scientific methods;
- participation in scientific events, fundamental scientific domestic and international projects;
- Leadership and team leadership;
- responsible and creative attitude to scientific and scientific-pedagogical activity;
- conducting a patent search and experience transferring scientific information using modern information and innovative technologies;
- protection of intellectual property rights to scientific discoveries and developments;
- free communication in a foreign language;

5) *be competent:*

- in the field of scientific and scientific-pedagogical activity in the conditions of rapid updating and growth of information flows;
- in carrying out theoretical and experimental scientific research;
- in the formulation and solution of theoretical and applied problems in scientific research;
- in conducting a professional and comprehensive analysis of problems in the relevant field;
- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in the examination of scientific projects and research;
- in ensuring continuous professional growth.

3.2 Requirements for the research and development work of a Ph.D. student:

- 1) compliance with the main problems of the educational program of doctoral studies, according to which a doctoral dissertation is defended;
- 2) relevant and contains scientific novelty and practical significance;
- 3) is based on modern theoretical, methodological and technological achievements of science and practice;
- 4) is based on modern methods of processing and interpreting data using computer technology;

5) is performed using modern research methods;

6) contains research (methodological, practical) sections on the main protected provisions.

3.3 Requirements for the organization of practices:

The practice is carried out with the aim of forming practical skills of scientific, scientific, pedagogical and professional activities.

The doctoral education program includes:

1) teaching and research practice - for students under the program of Doctor of Philosophy;

2) industrial practice - for students in the profile doctoral program.

During the period of teaching practice, doctoral students, if necessary, are involved in conducting classes in undergraduate and graduate programs.

The research practice of a doctoral candidate is carried out with the aim of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern methods of scientific research, processing and interpreting experimental data in a dissertation research.

The internship of the doctoral candidate is carried out in order to consolidate the theoretical knowledge gained in the learning process, and to improve the professional level.

The content of research and production practices is determined by the topic of the doctoral dissertation.

4 Work curriculum of the educational program

4.1. Duration of study: 3 years

Year of study	The code	Name of discipline	Component	Creditor		Лис/әср/тп	Prerequisite	The code	Name of discipline	Component	Creditor		Лис/әср/тп	Prerequisite
				ECTS	PK						ECTS	PK		
1	1 term							2 term						
	MET321	Research methods	BD	6		2/0/1/3		AAP350	Teaching practice	BD	10			
	LNG304	Academic writing	BD	6		2/0/1/3		AAP345	Doctoral student research, including internships and doctoral dissertations	MRW	124			
		Elective	BS UC	6										
		Elective	SD CO	6										
		Elective	SD CO	6										
		Total:			30				Total:			30	16	
2	3 term							4 term						
	AAP345	Doctoral student research, including internships and doctoral dissertations	MRW	24				AAP346	Doctoral student research, including internships and doctoral dissertations	MRW	25			
	AAP349	Research practice	SD	10										
		Total:			34				Total:			25		
2	5 term							6 term						

	AAP346	Doctoral student research, including internships and doctoral dissertations	MRW	25					AAP346	Doctoral student research, including internships and doctoral dissertations	MRW	25				
										Writing and defending a doctoral dissertation	FE	12				
		Total:		25						Total:		37				
										Total:		185				

ELECTIVE DISCIPLINE CATALOG

Educational program

Education program: 8D06103- «Management of information systems»

BD Choice component - 12 credits					
	Code	Name of disciplines	Credits	Lec/lab/prac/IWS	Semester
	CSE320	Computer modeling of processes and systems	6	2/0/1/3	1
	SEC302	Intelligent data analysis in information systems	6	2/0/1/3	1
		Total	6		
PS CC Choice component -18 credits					
	CSE319	Applied optimization methods	6	2/0/1/3	1
	CSE321	Database Design	6	2/0/1/3	1
	SEC301	Theory of computational modelling	6	2/0/1/3	1
		Total	12		

MODULAR CURRICULUM

Education program 8D06103- «Management of information systems»

Form of education: Full-time

Duration: 3 years

Academic degree: Doctor of philosophy PhD

The cycle	code	Name of disciplines	Semester	Acad. credits	lec.	lab.	prac	IWS	Type of control	Chair
Profile training module										
Basic disciplines (BD)										
University component										
BD	MET321	Research methods	1	6	2	0	1	3	Exam	G
BD	LNG304	Academic writing	1	6	2	0	1	3	Exam	EL
Choice component										
Modeling and analysis module										
BD	CSE320	Computer modeling of processes and systems	1	6	2	0	1	3	Exam	CIPaS
BD	SEC302	Intelligent data analysis in information systems	1	6	2	0	1	3	Exam	CIPaS
Practice-oriented module										
BD	AAP350	Pedagogical practice	2	10					Report	
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Major disciplines (MD)										
Choice component										
Optimization Learning and Data Driven Design Module										
MD	CSE319	Applied optimization methods	1	6	2	0	1	3	Exam	CIPaS
MD	CSE321	Database Design	1	6	2	0	1	3	Exam	CIPaS
MD	SEC301	Theory of computational modelling	1	6	2	0	1	3	Exam	CIPaS
Practice-oriented module										
MD	AAP349	Research scientific training	3	10					Report	
Research Module										
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	2	24					Report	
DSRW	AAP345	Doctoral student research work, including internships and doctoral dissertations	3	24					Report	
DSRW	AAP346	Doctoral student research work, including internships and doctoral dissertations	4	25					Report	
DSRW	AAP346	Doctoral student research work, including internships and doctoral dissertations	5	25					Report	
DSRW	AAP346	Doctoral student research work, including internships and doctoral dissertations	6	25					Report	
Final attestation module										
FA	ECA303	Writing and defending doctoral dissertation	6	12						
Total				185						

5 Descriptors of the level and volume of knowledge, skills, competencies

The third-level descriptors within the framework of the Comprehensive Qualifications Framework of the European Higher Education Area (RK-EHEA) reflect the learning outcomes characterizing the student's abilities:

- 1) demonstrate a systematic understanding of the field of study, mastery of the skills and research methods used in the field of information systems ;
- 2) demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;
- 3) to contribute by own original research to expanding the boundaries of the scientific field, which deserves publication at the national or international level;
- 4) critically analyze, evaluate and synthesize new and complex ideas;
- 5) communicate their knowledge and achievements to colleagues, the scientific community and the general public;
- 6) to promote the advancement in the academic and professional context of the technological, social or cultural development of a knowledge-based society.

6 ECTS Diploma Supplement

The application is developed according to the standards of the European Commission, Council of Europe and UNESCO / CEPES. This document is only for academic recognition and is not an official confirmation of the document on education. Without a diploma of higher education is not valid. The purpose of filling out the European Annex is to provide sufficient information about the holder of the diploma, the qualifications obtained by him , the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information about the national education system . The application model , which will be used for the transfer of estimates, uses the European system of transfers or credit transfer (ECTS).

European application the Diploma provides the opportunity to continue education in foreign universities, as well as to confirm the national higher education for foreign employers. When leaving for abroad for the professional recognition of the need to further the legalization of the diploma of education. The European Diploma Supplement is filled in the English language on individual request and is issued free of charge.

7 Description of disciplines

Protecting doctoral thesis

The CODE
CREDIT - 6

The purpose of the doctoral dissertation is to assess the scientific, theoretical and research and analytical level of a doctoral candidate, formed professional and managerial competencies, readiness for independent fulfillment of professional tasks and the compliance of its preparation with the requirements of a professional standard and an educational doctoral program.

SHORT DESCRIPTION

A doctoral dissertation is the scientific work of a doctoral candidate, which is an independent study in which theoretical principles are developed, the totality of which can be qualified as a new scientific achievement, or a scientific problem is solved, or scientifically based technical, economic or technological solutions are presented, the introduction of which makes a significant contribution to the development economy of the country.

Doctoral dissertation - the result of research / experimental - research work of a doctoral candidate , carried out during the entire period of study of a doctoral student .

The defense of a doctoral dissertation is the final stage in the preparation of a master's degree. The master's thesis must meet the following requirements:

- The topic of the dissertation should be related to the priority areas of the development of science and / or state programs or programs of basic or applied research.

- The content of the dissertation, the goals and objectives, scientific results obtained must strictly correspond to the topic of the dissertation.

- The dissertation is carried out in compliance with the principles of independence, internal unity, scientific novelty, reliability and practical value.

Intellectual analysis of data in information systems

The CODE – SEC302
CREDIT – 5

GOAL AND OBJECTIVES OF THE COURSE

The purpose of the discipline is the training of doctoral students in data mining using modern software in various fields of human activity.

TASKS OF DISCIPLINE

Mastering data mining methods found in computer information systems.

SHORT DESCRIPTION OF THE COURSE

The content of the discipline includes modern practice of applying data mining, a methodology for mining various data for use in practice and research.

KNOWLEDGE, SKILLS, SKILLS FOR WRITING COURSE

As a result of studying the discipline should know:

- basic theoretical concepts and methodology for the mining of various data ;
- Modern software tools for effective data mining for use in practice and research.

As a result of studying the discipline should be able to:

- apply modern computer technology in solving problems of intellectual analysis and use the results in their professional activities.

Computer simulation of processes and systems

The CODE CSE320

CREDIT – 6

GOAL AND OBJECTIVES OF THE COURSE Study of the principles and methods of modeling and research of the dynamics of functioning of complex production, economic and organizational systems in the conditions of uncertainty and instability of their parameters and processes

SHORT DESCRIPTION OF THE COURSE

Modeling of unstable parameters and processes, formalized in the form of continuous, discrete, multidimensional random variables and Markov, Gaussian processes. Modeling of ordinary and extraordinary flows of events. Identification of random patterns. Modeling queuing systems with anticipation. Modeling the distribution of investments in the face of uncertainty and risks. Modeling inventory management systems.

KNOWLEDGE , SKILLS, SKILLS FOR COMPLETION OF THE COURSE

The student **must know the** methods of modeling random variables with analytically and non-traditionally defined distribution laws; typical classes of organization models for servicing application flows with various priorities, modeling methods for production, economic and organizational systems under conditions of instability of their parameters and processes;

must be able to formalize the parameters and processes of complex systems, simulate a wide range of unstable and random characteristics of systems and processes;

must have the skills to develop modeling algorithms for the functioning of the elements of the studied objects and process and analyze the results of simulation modeling.

Applied Optimization Techniques

The CODE CSE319

CREDIT – 6

GOAL AND OBJECTIVES OF THE COURSE

Training of highly qualified personnel who know the basics of making optimal decisions in planning, designing and forecasting in various areas of human life, in particular, knowing the methods of unconditional and conditional optimization, mathematical and dynamic programming, methods for solving network problems.

SHORT DESCRIPTION OF THE COURSE

The content of the discipline “Applied Optimization Methods” includes the study of methods of classical optimization of processes described by differentiable functions, modern areas of mathematical programming based on duality theory, as well as a wide range of network problems. The procedures of using standard structures and models for the analysis and optimization of economic, production and organizational processes in case of random external influences and incomplete information on state variables are considered.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE

The student **must know**

- mathematical models and decision-making methods based on the classical optimization apparatus;
- mathematical models and decision-making methods based on mathematical programming;
- mathematical models and methods for making optimal decisions with incomplete information about the object of study ;

must be able

- develop mathematical models and methods for constructing optimal control systems under random external influences ;
- substantiate the choice of the structure of optimization algorithms depending on the characteristics of the production process;

must have skills

- formalization of processes occurring in production, economic and organizational systems;
- processing and analysis of the results.

Database Design

The CODE – CSE321

CREDIT – 6

GOAL AND OBJECTIVES OF THE COURSE

Discipline devoted to the study of theoretical foundations and practical methods and tools for database design, as well as issues related to the life n nym cycle support, and database support. Think about a novnye database design concepts, methods of their classification, principles organisms and tion of data structures and the corresponding types of database management systems

SHORT DESCRIPTION OF THE COURSE

Course «Database Design» mainly focused on doctoral , continuing to work with databases The questions collective access to people and n nym, introduced the concept of referential integrity and semantic data integrity, transaction blocking (capture), the deadlock associated with them straight on Blem and methods for solving them. Questions of safety and security of STI data backup methods and compression (packing) of data. Provides an overview of the hierarchical, not relational and post-relational databases, object-oriented databases, full-text databases, networking and distributed databases, as well as a joint venture e tsializirovannyh database . A survey of specialized hardware and so on grammnyh funds intended for the construction of the database economical e tion direction.

KNOWLEDGE , SKILLS, SKILLS FOR COMPLETION OF THE COURSE

Doctoral students should know the basic sentences of the SQL query language; be able to put into practice complex data structures (lists, hierarchies, networks) using relational DBMS; have an idea of the main problems of collective access to data; Know the basic concepts and principles of the organization of transaction processing (OLTP); have an idea of non-relational DBMS and tasks solved with their help; understand the main stages of the life cycle of databases, support and were accompanied Well Denia, know the method of data backup; have an idea of specialized database machines and their system software.

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