EDUCATIONAL PROGRAMME: 7M06102 - Information Systems

1. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Optional component 1

Course: **Research Methodology in Information Systems**
Intensity of the Course: 5 academic credits
Module Code: RMIS-501/1
Module Name: Research and management IS
Prerequisites: Fundamentals of scientific research
Purpose: Methodology of scientific research in information systems formation of skills in search, collection and processing of scientific information
Short Description: The study of the conceptual apparatus of the discipline, the main theoretical provisions and methods, the acquisition of skills in applying theoretical knowledge to solve practical problems.
Learning Outcomes in EP (LOP):
LOP 1 - Masters current problems of modern philosophical science;
LOP 6 - Use the skills of preparing publications and scientific and technical reports based on the results of scientific research in the field of design and development of information systems;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data
Learning Outcomes in Course (LOC):
LOC 1 – study of the methodology of scientific and technical creativity, development of creative abilities
LOC 2 – knowledge of modern research methods
LOC 3 – acquisition of skills in the application of modeling methods in science and technology
Post requisites: Data and knowledge management in information systems (methodology for organizing the design and development of information systems)

Optional component 1

Course: **Research Methodology in Information Systems**
Intensity of the Course: 5 academic credits
Module Code: RMIS-501/2
Module Name: Research and management IS
Prerequisites: Fundamentals of scientific research
Purpose: Teach how to use information systems used in project management
Short Description: As a result of studying the discipline, undergraduates can get a systematic knowledge of the principles of object - oriented design, programming and testing of software systems, make a template for standard solutions and components of information processing systems; draw up technical tasks for the designed automation object, taking into account the results of research and development work.
Learning Outcomes in EP (LOP):
LOP 1 - Masters current problems of modern philosophical science;
LOP 6 - Use the skills of preparing publications and scientific and technical reports based on the results of scientific research in the field of design and development of information systems;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data
Learning Outcomes in Course (LOC):
LOC 1 –planning and organization of the project monitoring system
LOC 2 – creating project management processes and functions
Post requisites: Data and knowledge management in information systems (methodology for organizing the design and development of information systems)

Optional component 2

Course: **Multi-criteria decision making tasks**
Intensity of the Course: 5 academic credits
Module Code: RMIS-502/1
Module Name: Research and management IS
Prerequisites: Mathematics, computer modeling
Purpose: Principles of deep research using mathematical modeling, formation of analytical, numerical and simulation methods and practical implementation skills
Short Description: As a result of studying the discipline, the student is able to learn more about the principles of building information systems based on mathematical modeling using analytical, digital and simulation methods; optimize information systems taking into account the requirements for the quality of their functioning.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 5 - Study of methods of analysis and optimization of information systems and technologies;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data
Learning Outcomes in Course (LOC):
LOC 1 – Ability to predict production, economic, and social conditions at any level of the Manager at the preparatory stage of decision - making
LOC 2 – analysis of methods for effective use of the decision-making process
LOC 3 – modeling of information systems for decision making
Post requisites: Methods of artificial intelligence in information systems (knowledge engineering and intelligent systems)

Optional component 2

Course: **Theoretical foundations of decision making**
Intensity of the Course: 5 academic credits
Module Code: RMIS – 502/2
Module Name: Research and management IS
Prerequisites: Mathematics, computer modeling
Purpose: The decision-making process is intuitive, judgment-based, or an effective description.
Short Description: Basic concepts of the decision-making process. Modern methods of building decision support systems (pdts), principles of visualization of the decision-making process (pdts). Methods for achieving goals.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 5 - Study of methods of analysis and optimization of information systems and technologies;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data
Learning Outcomes in Course (LOC):
LOC 1 –ability to predict production, economic, and social conditions at any level of the Manager at the preparatory stage of decision - making
LOC 2 – analysis of methods for effective use of the decision-making process
LOC 3 –modeling of information systems for decision making

Post requisites: Methods of artificial intelligence in information systems (knowledge engineering and intelligent systems)

Optional component 3

Course: **Project Management Information Systems**
Intensity of the Course: 5 academic credits
Module Code: RMIS – 503/1
Module Name: Research and management IS
Prerequisites: IT management. IT project management
Purpose: Formation of skills in the application of information systems used in project management.
Short Description: As a result of studying the discipline, students acquire theoretical knowledge and practical skills in applying a set of technological and organizational techniques and tools that support project management in organizations and help improve the effectiveness of their implementation.
Learning Outcomes in EP (LOP):
LOP 3 - Provides information security when using information services;
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field
Learning Outcomes in Course (LOC):
LOC 1 – development of processes used in management
LOC 2 – development of information technology programs in project management
LOC 3 – working with information systems
Post requisites: Quality management of IT projects (design of distributed is)

Optional component 3

Course: **Management of IT projects**
Intensity of the Course: 5 academic credits
Module Code: RMIS - 503/2
Module Name: Research and management IS
Prerequisites: IT management. IT project management
Purpose: Mastering the theoretical foundations of Business processes, familiarizing with business process modeling methods, developing business process management skills.
Short Description: As a result of studying the discipline, undergraduates develop theoretical knowledge and practical skills in the organization of enterprise it infrastructure management based on the concept of information services, information systems management model (ITSM), ITIL libraries (it infrastructure library).
Learning Outcomes in EP (LOP):
LOP 3 - Provides information security when using information services;
LOP 4 -To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field
Learning Outcomes in Course (LOC):
LOC 1 –business process modeling
LOC 2 –process management on a theoretical basis
Post requisites: Quality management of IT projects (design of distributed is)

2 OPTIONAL COMPONENT OF THE CYCLE OF MAJOR COURSES

Optional component 1

Course: **Principles of object-oriented design and programming**
Intensity of the Course: 5 academic credits
Module Code: DCIT – 501/1
Module Name: Design and development of information technologies
Prerequisites: Database in information systems.
Purpose: Methods of Object-Oriented Analysis and design, methods of developing software applications aimed at recoding (reuse methods), formation of knowledge with a single modeling language (UML), typical design methods (design models).
Short Description: As a result of studying the discipline, undergraduates can get a systematic knowledge of the principles of object-oriented design, programming and testing of software systems, make a template for standard solutions and components of information processing systems; make technical specifications for the designed automation object, taking into account the results of research and development work.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 6 - Use the skills of preparing publications and scientific and technical reports based on the results of scientific research in the field of design and development of information systems;
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field
Learning Outcomes in Course (LOC):
LOC 1 – Unified foundations of UML modeling, formation of the concept of the same design method
LOC 2 – Automatic control using modern software tools
LOC 3 – Implementation of the selection of the correct composition of Object-Oriented Software
Post requisites: master's thesis defense

Optional component 1

Course: **Digital image processing**
Intensity of the Course: 5 academic credits
Module Code: DCIT 501/2
Module Name: Design and development of information technologies
Prerequisites: Database in information systems.
Purpose: The aim is to master the basics of digital image processing and analysis using modern methods and technologies. They study the principles of digital filters, image processing algorithms, as well as ways to implement them using digital signal processors.
Short Description: Approaches to digital signal processing using digital signal processors, the design methodology of digital filters provide ways to implement them in digital signal processors and the structure and characteristics of signal processors
Learning Outcomes in EP (LOP):
LOP 1 - Understanding the basic concepts and principles of digital image processing.
LOP 2 - The ability to apply various image processing methods using digital filters and signal processors.
LOP 3- Skills in working with image processing software and analyzing their characteristics.
LOP 4- is the ability to analyze and interpret the results of image processing in order to identify information or improve image quality.
Learning Outcomes in Course (LOC):
LOC 1 -Mastering the methods and technologies of digital image processing.

LOC 2 -The ability to independently develop and apply image processing algorithms to solve specific problems.
LOC 3 - Readiness to apply the acquired knowledge and skills in professional activities related to the processing and analysis of digital images in such areas as medical diagnostics, video surveillance, computer vision and others.
Post requisites: master's thesis defense

Optional component 2

Course: **Computer networks and telecommunications**
Intensity of the Course: 5 academic credits
Module Code: DCIT 502/1
Module Name: Design and development of information technologies
Prerequisites: Computer network
Purpose: Enabling the organization of computer networks and the use of network resources.
Short Description: Competencies undergraduates as a result of studying the discipline: analysis of the functioning of computer communication systems based on modern telecommunications equipment, network technologies and 6 protocols; administration of corporate networks, taking into account fault tolerance, scale and quality of service.
Learning Outcomes in EP (LOP):
LOP 5 - Study of methods of analysis and optimization of information systems and technologies
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field
Learning Outcomes in Course (LOC):
LOC 1 – design of functioning of computer communication systems based on network technologies and protocols
LOC 2 – analysis of methods for effective use of computer network construction tools
Post requisites: Complex security of information technologies and systems (methods and means of computer information Protection)

Optional component 2

Course: **Computer Network Architecture and Technology**
Intensity of the Course: 5 academic credits
Module Code: DCIT 502/2
Module Name: Design and development of information technologies
Prerequisites: Computer network
Purpose: Formation of skills for analyzing and evaluating the architecture of computer networks and its components.
Short Description: As a result of studying the discipline, students will acquire knowledge about modern routing protocols, the design of modern networks, the principles of optimization of routing using multiple routing in a hierarchical network, the IPv6 Protocol; understanding the capabilities of the IPv6 expanded address space, addressing architecture, IPv6, Multiprotocol switching MPLS, Softswitch technology, control of multiservice networks.
Learning Outcomes in EP (LOP):
LOP 5 - Study of methods of analysis and optimization of information systems and technologies
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field
Learning Outcomes in Course (LOC):

LOC 1 – the design of the network technologies
LOC 2 – analysis of methods for effective use of computer network construction tools

Post requisites: Complex security of information technologies and systems (methods and means of computer information Protection)

Optional component 3

Course: **Methods of artificial intelligence in information systems**

Intensity of the Course: 5 academic credits
Module Code: DCIT 503/2
Module Name: Design and development of information technologies
Prerequisites: Multi-criteria decision-making problems (theoretical foundations of decision-Making)
Purpose: creation and application of intelligent automated information systems.
Short Description: As a result of studying of discipline students acquire knowledge and practical skills according to the General rules of the theory of artificial neural networks and their applications to IP, the structure of single layer and multilayer neural networks, the development of specific methods of training the neural network, classification learning algorithms, determining the class of problems solved using perceptron.
Learning Outcomes in EP (LOP):

LOP 5 - Study of methods of analysis and optimization of information systems and technologies
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field

Learning Outcomes in Course (LOC):

LOC 1 –Introduction to the General rules of the theory of artificial neural networks and their application in IS;
LOC 2 –Application in IS, development of specific neural network training methods
LOC 3 –defining a class of problems to be solved using a perceptron

Post requisites: master's thesis defense

Optional component 3

Course: **Knowledge Engineering and Intelligent Systems**
Intensity of the Course: 5 academic credits
Module Code: DCIT 503/2
Module Name: Design and development of information technologies
Prerequisites: Multi-criteria decision-making problems (theoretical foundations of decision-Making)
Purpose: Forming ideas about the types of problems that arise in the field of data Mining and how to solve them.
Short Description: Acquisition of intellectual knowledge and skills in the field of data processing, the method of knowledge representation and their use in information systems. The tasks of mastering the disciplines include studying students to solve a number of problems that require the development of basic principles and algorithms for processing intellectual data, knowledge representation, and adjusting the system to changing data that can be considered intelligent.
Learning Outcomes in EP (LOP):

LOP 5 - Study of methods of analysis and optimization of information systems and technologies
LOP 7 - Planning of digital experiments, interpretation of results and conclusions when conducting research in this field

Learning Outcomes in Course (LOC):

LOC 1 – intelligent processing of data, the acquisition of knowledge and skills

LOC 2 – consideration of the problems of the use in intelligent systems
Post requisites: master's thesis defense

Optional component 4

Course: **Web site design and development tools**
Intensity of the Course: 5 academic credits
Module Code: ASSR 604/2
Module Name: Automated Research Systems
Prerequisites: Project Management Information Systems (Management of IT projects)
Purpose: knowledge of technologies, organizational skills and ability to work with the Internet, training in methods for designing applications in the internet environment.
Short Description: Web Application Development Fundamentals. Software classification. Programming for web programming. Both the client and server execute the application. Development of application interface, interactive interface, navigation. Syntax notation and scripting language (HTLM, XML, JS, VBS, PERL, PHP).
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data.
Learning Outcomes in Course (LOC):
LOC 1 – Training in processing service information on the internet and Web technologies
LOC 2 – creating a software application based on modern Web technologies
LOC 3 – Choosing to provide knowledge of programming tools for creating a web site on the server and client side
Post requisites: master's thesis defense

Optional component 4

Course: **Design and analysis of Web-interfaces**
Intensity of the Course: 5 academic credits
Module Code: ASSR 604/2
Module Name: Automated Research Systems
Prerequisites: Project Management Information Systems (Management of IT projects)
Purpose: development of skills in mastering technologies, organizational skills and the ability to work with the internet, use methods for designing applications in the internet environment.
Short Description: The use of web technologies in industrial enterprises stages of development, design and implementation of information systems in the field of energy. Technology case. Industrial ERP - development - systems. Development of telecommunication information systems using web technologies.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data.
Learning Outcomes in Course (LOC):
LOC 1 – Training in processing service information on the internet and Web technologies
LOC 2 – creating a software application based on modern Web technologies

LOC 3 – Choosing to provide knowledge of programming tools for creating a web site on the server and client side
Post requisites: master's thesis defense

Optional component 5

Course: **Integrated security of information technology and systems**
Intensity of the Course: 6 academic credits
Module Code: ASSR 601/1
Module Name: Automated Research Systems
Prerequisites: Data protection and security in information systems (Information security in computer networks)
Purpose: formation of skills for comparative analysis of complex security models of computer systems
Short Description: As a result of studying the discipline, undergraduates acquire theoretical knowledge and practical skills to ensure comprehensive security of information technologies and systems at modern enterprises in accordance with the requirements of regulatory legal acts, regulatory methodological documents of the Republic of Kazakhstan and advanced world innovative technologies.
Learning Outcomes in EP (LOP):
LOP 3 - Provides information security when using information services;
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research
Learning Outcomes in Course (LOC):
LOC 1 – protection and provision of comprehensive information technology security
LOC 2 – consideration of the calculation of the expected effectiveness of the information security system
Post requisites: master's thesis defense

Optional component 5

Course: **Methods and means of protecting computer information**
Intensity of the Course : 6 academic credits
Module Code: ASSR 601/2
Module Name: Automated Research Systems
Prerequisites: Data protection and security in information systems (Information security in computer networks)
Purpose: development of proposals for improving the management system for information security methods, formation of skills for processing results, identifying the reliability of the results of error assessment.
Short Description: Introduction to the main methods of ensuring and determining the reliability and quality indicators of automated systems related to information systems, introduction to the main provisions of this theory, the concepts of calculating and evaluating the reliability of computers and systems
Learning Outcomes in EP (LOP):
LOP 3 - Provides information security when using information services;
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research
Learning Outcomes in Course (LOC):
LOC 1 – knowledge of information security objects and their classification
LOC 2 – effectiveness of information security solutions for information systems
LOC 3 – mastering the assessment of expected security and effectiveness of the information security system
Post requisites: master's thesis defense

Optional component 6

Course: **Modeling and visualization in big data systems**
Intensity of the Course: 6 academic credits
Module Code: ASSR 602/1
Module Name: Automated Research Systems
Prerequisites: IP analysis, modeling and design
Purpose: developing skills for processing and modeling combined data of large volume, rapidly changing and poorly structured data.
Short Description: As a result of studying the discipline, undergraduates have theoretical knowledge and practical skills in the development and use of systems for analyzing and processing large data sets, which allow them to perform the following professional tasks: setting tasks for big data analysis, pre-processing data, data visualization, development, implementation and application of data mining methods in a large data set, presentation of work results.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 5 - Study of methods of analysis and optimization of information systems and technologies;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data.
Learning Outcomes in Course (LOC):
LOC 1 – creating and modeling big data Analytics applications
LOC 2 – implementation of big data algorithms and analysis methods
Post requisites: master's thesis defense

Optional component 6

Course: **Big Data Processing Technologies**
Intensity of the Course: 6 academic credits
Module Code: ASSR 602/2
Module Name: Automated Research Systems
Prerequisites: IS analysis, modeling and design
Purpose: Developing skills in applying the main technologies and tools for working with big data.
Short Description: As a result of studying the discipline, the master of science has theoretical knowledge and practical skills in the development and use of systems for analyzing and processing large data sets, which allow performing the following professional tasks: setting tasks for big data analysis, data preprocessing, data visualization, development, implementation and application of data mining methods in a large data set, presentation of work results.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 5 - Study of methods of analysis and optimization of information systems and technologies;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data.
Learning Outcomes in Course (LOC):
LOC 1 – using big data analysis methods
LOC 2 – implementing big data Analytics applications
LOC 3 – implementation of algorithms for building big data and analysis methods.

Post requisites: master's thesis defense

Optional component 7

Course: **Quality management of IT projects**
Intensity of the Course: 6 academic credits
Module Code: ASSR 603/1
Module Name: Automated Research Systems
Prerequisites: Methodology of scientific research in information systems (methodology of organization of design and development of information systems)
Purpose: acquisition of practical skills to perform the main functions of complex software design of modern IT projects
Short Description: Relationship of project management methodology to other management disciplines, project structuring, models used for project structuring, main project justification work, project plan development, organizational structures, responsibility matrix, project risk management, project Monitoring and reporting.
Learning Outcomes in EP (LOP):
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 6 - Use the skills of preparing publications and scientific and technical reports based on the results of scientific research in the field of design and development of information systems
Learning Outcomes in Course (LOC):
LOC 1 – managing training, IT project support, and changes in the user community
LOC 2 – using IT operations and management trends
Post requisites: master's thesis defense

Optional component 7

Course: **Distributed IS Design**
Intensity of the Course: 6 academic credits
Module Code: ASSR 603/2
Module Name: Automated Research Systems
Prerequisites: Methodology of scientific research in information systems (methodology of organization of design and development of information systems)
Purpose: Stages of IP design: modeling business cases, building a model of business objects, building a conceptual data model, forming system requirements, developing analysis skills
Short Description: As a result of studying the discipline, undergraduates can get a systematic knowledge of the principles of object-oriented design, programming and testing of software systems, make a template for standard solutions and components of information processing systems; draw up technical tasks for the designed automation object, taking into account the results of research and development work.
Learning Outcomes in EP (LOP):
LOP 3 - Provides information security when using information services;
LOP 4 - To simulate the processes and objects on the basis of standard packages of automated designing and research;
LOP 6 - Use the skills of preparing publications and scientific and technical reports based on the results of scientific research in the field of design and development of information systems;
LOP 8 - Develops new tools and applications for modeling research tasks and collecting, storing, analyzing, and managing data.

Learning Outcomes in Course (LOC):

LOC 1 – creating UML diagrams used in information system design

LOC 2 – designing large-scale information applications

Post requisites: master's thesis defense