S.Seifullin Kazakh Agrotechnical Research University, 2025 year

Confirm
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«___» _____ 2025y

CATALOG OF ELECTIVE DISCIPLINES

For students in the direction of preparation 6B061 Information and Communication technologies

Brief description of the elective disciplines of the educational program

EPG	EP	Form of education	The name of discipline	Code of subject	Discipline cycle	Component	Number of credits	Level of training	EPG	Course	Academic period	Pre-requisitions	Post-requisitions	Brief content of the discipline	Key learning outcomes	Name of the alternative discipline
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Computational methods on a computer	VME 2285	BS	Elective subjects	5.0	Bachelor	Information systems	2	1	Mathematical analysis Basics of programming	Introduction to software engineering	Basic numerical methods for the study of objects; theoretical foundations for the construction of methods for the numerical solution of algebraic and transcendental equations; Analysis of the results obtained for solving applied problems	Understand flexible software development methodologies, demonstrate knowledge of database management, present ideas of continuous integration and continuous software delivery, as well as use modern technical tools and information technologies	Applied statistical analysis
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Applied statistical analysis		BS	Elective subjects	5.0	Bachelor	Information systems	2	1	Mathematical analysis Basics of programming	Probability theory and mathematical statistics	The course is aimed at developing students' skills in applying statistical analysis to study data and make informed decisions in various fields. It includes the basics of statistics, analysis methods, statistical programming (R, Python), application in various fields, interpretation of results and implementation of practical projects.	Understand the problems of creating algorithms for solving problems and describing them using programming languages, navigate various programming environments, know the control structures of scripting languages, and apply methods of analyzing the applied field at the conceptual, logical, mathematical, and algorithmic levels.	Computational methods on a computer
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Ecology, life safety principles and SDG	EOBZhC 2286	BS	Elective subjects	3.0	Bachelor	Ecology	2	2	Physics	Mathematical logic and theory of algorithms	The discipline studies the interrelation of environmental science with other sciences, the patterns of interaction between organisms and their habitat, the laws of development and existence of biogeocenoses as complexes of interacting living and inanimate components in various parts of the biosphere, the goals of sustainable development (namely, global problems of humanity and ways to solve them), issues of preserving human health and life in the technosphere, protection from hazards of man-made and natural origin and the creation of comfortable living conditions.	To present projects based on scientific research in the field of information technology. Demonstrate entrepreneurial skills in compliance with academic integrity standards, as well as interpret information in the fields of ICT, ecology, economics, law, Sustainable Development Goals (SDGs) and inclusive approaches in software development.	Basics of anti-corruption culture, Technical english
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Basics of anti-corruption culture	OAK 2282	BS	Elective subjects	3.0	Bachelor	Economy	2	2	Economics, Law and Finance in Entrepreneurship	Mathematical logic and theory of algorithms	The course forms a system of knowledge on combating corruption, and develops on this basis a civil position in relation to this phenomenon. The discipline studies the fundamentals of legislation; normative legal acts, moral and legal norms.	Analyze in a logical and quantitative way the conditions for the development of production and evaluate the competitiveness of created products on the principles of engineering, study innovative entrepreneurship and anti-corruption culture, formulate inventions	Ecology, life safety principles and SDG, Technical english

B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Technical english	TAYa 2249	BS	Elective subjects	3.0	Bachelor	Иностранных языков	2	2	Foreign language	Mathematical logic and theory of algorithms	Basic vocabulary of texts in the specialty. Extraction of general information from the adapted text of the specialty. Confirmation or refutation of information from adapted texts in the specialty. Stable phrases that are most often found in professional speech. Oral and written presentation of the content of the adapted text in the specialty. Official-business style of communication. Scientific style. Basics of abstracting, annotating. Business documentation	To present projects based on scientific research in the field of information technology. Demonstrate entrepreneurial skills in compliance with academic integrity standards, as well as interpret information in the fields of ICT, ecology, economics, law, Sustainable Development Goals (SDGs) and inclusive approaches in software development.	Basics of anti-corruption culture, Ecology, life safety principles and SDG
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Web development	WP 2263	BS	Elective subjects	5.0	Bachelor	Information systems	2	2	Fundamentals of object-oriented programming Basics of database technology	Scripting programming languages	Features of IP protocols versions 4 and 6. IP tunnels. Designing a site. Principles of construction of hypertext information systems. Client web technologies: HTML, CSS, JavaScript, HTML5, Ajax, JQuery, XML; JavaScript scripting language, jQuery. Programming in PHP, PHP7. Framework YII, Laravel. SQL query language. Create MySQL database. PostgreSQL DBMS.	Understand the problems of creating algorithms for solving problems and describing them using programming languages, navigate various programming environments, know the control structures of scripting languages, and apply methods of analyzing the applied field at the conceptual, logical, mathematical, and algorithmic levels.	Python and data analysis
	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Python and data analysis		BS	Elective subjects	5.0	Bachelor	Information systems	2	2	Algorithms and data structures for developers Basics of programming	Development and analysis of software requirements	During the course, students are introduced to the rapidly evolving field of data analysis, with a particular focus on the Python programming language. Students will learn the concepts, methods, and tools they need to draw meaningful conclusions based on real-world economic data analysis. The course is specifically designed for people with no prior programming experience.	Understand the problems of creating algorithms for solving problems and describing them using programming languages, navigate various programming environments, know the control structures of scripting languages, and apply methods of analyzing the applied field at the conceptual, logical, mathematical, and algorithmic levels.	Web development
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Design and architecture of software systems	PAPS 3260	BS	Elective subjects	5.0	Bachelor	Information systems	3	1	Software development technologies and standards	Introduction to parallel programming	A complex of parallel running programs. Layered architecture. Means of program interaction. Methods and means of information security software systems. Standards and profiles in the field of software systems. Methodological foundations of software systems design. Requirements analysis. Ascending and descending methods of software development. Interface design. Software models with structural and object-oriented approach. Documenting software systems. Computer-aided design and documentation of software products.	Apply modern effective methods of IT project management, possess professional skills of a Project manager, design and develop IS in compliance with the principles of IT security.	Design of software systems and complexes
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Design of software systems and complexes	PPSK 3276	BS	Elective subjects	5.0	Bachelor	Information systems	3	1	Software development methodologies	Basics of Software Testing	The industry of industrial development of software systems. Architecture of software systems. Architectural structures and representations. Modular structures. Distribution structures. Variants of software system architectures. The life cycle of software systems. PS design strategies. Design of software systems. Setting requirements for the PS. Development of technical specifications for the design of software systems. Requirements analysis and development of external specifications. Structural design.	Apply modern effective methods of IT project management, possess professional skills of a Project manager, design and develop IS in compliance with the principles of IT security.	Design and architecture of software systems

B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Databases for DevOps	BDDD 3279	BS	Elective subjects	5.0	Bachelor	Information systems	3	1	Basics of database technology	Fundamentals of big data processing technology	Databases and database management systems. Functional composition. Classification of database architectures. System directories. Data models. Multi-user services. NoSQL class database management systems. The difference is SQL vs. NoSQL. The NoSQL model. Types of systems. Storage and access to complex data structures	Understand flexible software development methodologies, demonstrate knowledge of database management, present ideas of continuous integration and continuous software delivery, as well as use modern technical tools and information technologies	Company database management systems (Oracle)
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Company database management systems (Oracle)	SUBDKO 3269	BS	Elective subjects	5.0	Bachelor	Information systems	3	1	Basics of database technology	Fundamentals of big data processing technology Methods and systems of big data processing	Relational data model. Basic operations of relational algebra: selection, projection, Cartesian product. Data models. Technology and principles of database design. Modeling of the subject area. Principles of organization of Oracle DBMS. Organization of external memory. The level of direct data management in external memory. Database design in Oracle DBMS. The main components of the Oracle database. Client-server data organization models	Understand flexible software development methodologies, demonstrate knowledge of database management, present ideas of continuous integration and continuous software delivery, as well as use modern technical tools and information technologies	Databases for DevOps
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Basics of neural networks	ONS 3273	BS	Elective subjects	5.0	Bachelor		3	2	Virtualization and containerization technologies	Introduction to artificial intelligence	Introduction to the theory of neural networks. Models of neurons. Methods of learning a single neuron. Algorithms for learning networks of general form. Analytical teaching methods. Programming neural networks. Genetic Algorithms. Selection of the optimal architecture of neural networks.	Solve problems of varying complexity using programming technology, inspect software components apply the mathematical apparatus of ICT to build algorithms for analysis, transformation, processing and to optimize information processes in various application areas apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels use technologies, principles of organization and functioning of the Internet, analyze threats to information security	Neural networks and their applications
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Neural networks and their applications	NSIP 3255	BS	Elective subjects	5.0	Bachelor	Information systems	3	2	Virtualization and containerization technologies	Introduction to artificial intelligence Introduction to machine learning	Artificial neural networks. Architecture of artificial neural networks. A set of tools for creating, initializing, training, modeling and visualizing a network. Methods and algorithms for training artificial neural networks. Gradient learning algorithms. Algorithms based on the use of the conjugate gradient method. Application of neural networks for designing control systems for dynamic processes.	Solve problems of varying complexity using programming technology, inspect software components apply the mathematical apparatus of ICT to build algorithms for analysis, transformation, processing and to optimize information processes in various application areas apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels use technologies, principles of organization and functioning of the Internet, analyze threats to information security	Basics of neural networks

B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Methods and systems of big data processing	MSOBD 4274	BS	Elective subjects	5.0	Bachelor	Information systems	4	1	Company database management systems (Oracle)	Visual programming and data mining	Introduction, distributed file systems. The MapReduce calculation model. SQL over BigData. Hive. Beyond MapReduce. Spark. Machine learning on big data. Streaming data processing. Key-value of storage in big data.	Apply modern technologies and methods of data collection, processing and analysis, including the use of intelligent information and analytical systems, in solving management and research tasks.	Fundamentals of big data processing technology
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Fundamentals of big data processing technology	OTOBD 4265	BS	Elective subjects	5.0	Bachelor	Information systems	4	1	Company database management systems (Oracle)	Visual programming and data mining	Introduction to Big Data. Technologies for collecting and storing big data. Big data processing and analysis technologies in modern IT infrastructure: The lifecycle of Big Data analysis, standards.	Apply modern technologies and methods of data collection, processing and analysis, including the use of intelligent information and analytical systems, in solving management and research tasks.	Methods and systems of big data processing
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Introduction to artificial intelligence	VII 4272	BS	Elective subjects	7.0	Bachelor	Information systems	4	1	Basics of neural networks Neural networks and their applications	Intelligent data analysis	Representation of knowledge in intelligent systems. Algorithms for logical inference based on knowledge. Representation of fuzzy knowledge. Decision making under conditions of incomplete certainty. Stages of development of expert systems. Modern Machine Learning. Problems of classification and regression. Evaluation of the quality of machine learning algorithms. Clustering tasks. Search for outliers and anomalies in data.	To formulate and solve artificial intelligence tasks, including decision support tasks, to use knowledge engineering methods, and the capabilities of artificial intelligence systems in applications.	Introduction to machine learning
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Introduction to machine learning	VMO 4266	BS	Elective subjects	7.0	Bachelor	Information systems	4	1	Basics of neural networks Neural networks and their applications	Visual programming and data mining -	Theoretical knowledge and Data management tasks, including data loading, data transformation, and preliminary data analysis and visualization, familiarity with the main tasks and models of machine learning. Methods for assessing the quality of work of various machine learning models, understanding the process of integrating machine learning models within the framework of tasks.	To formulate and solve artificial intelligence tasks, including decision support tasks, to use knowledge engineering methods, and the capabilities of artificial intelligence systems in applications.	Introduction to artificial intelligence
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Parallel programming	PP 4277	BS	Elective subjects	5.0	Bachelor		4	1	Introduction to software engineering Fundamentals of mathematical and computer modeling	Business process modeling	Basic information about parallel computers. Performance Analysis. First steps towards parallel programming. Scalable algorithmic methods. Stream programming. MPI standard and other local level languages. ZPL language and other global languages. Perspective directions in parallel programming	Implement analytical and technological solutions in the field of software (system, applied and instrumental) and computer information processing, as well as master the methods of teaching mathematical and algorithmic modeling of scientific and technical educational tasks.	Introduction to parallel programming
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Introduction to parallel programming	VPP 4267	BS	Elective subjects	5.0	Bachelor	Information systems	4	1	Introduction to software engineering Fundamentals of mathematical and computer modeling	Fundamentals of information management	The discipline studies basic information about parallel computers. Performance analysis. The first steps in the direction of parallel programming. Scalable algorithmic methods. Streaming programming. MPI standard and other local-level languages. The ZPL language and other global-level languages. Assessment of the current state of the issue.	Implement analytical and technological solutions in the field of software (system, applied and instrumental) and computer information processing, as well as master the methods of teaching mathematical and algorithmic modeling of scientific and technical educational tasks.	Parallel programming

B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Intelligent data analysis	IAD 4280	BS	Elective subjects	5.0	Bachelor	Computer science	4	2	Introduction to artificial intelligence Introduction to machine learnin	Fundamentals of Scientific Research in the Field of Information Technology	Discipline NumPy functions of linear algebra, SciPy mathematical algorithms and functions for data processing and visualization, Matplotlib is a library for creating 2D graphs in Python, R and RStudio environments, data access operators, functions and arguments, loops and conditional operators, R DBMS , setting. Teaches statistical calculations and graphs in R.	To formulate and solve artificial intelligence tasks, including decision support tasks, to use knowledge engineering methods, and the capabilities of artificial intelligence systems in applications.	Visual programming and data mining
B057 - «Information technology»	6B06104 - «DevOps Engineering»	Full-time (bachelor 4 years) semester	Visual programming and data mining	VPIAD 4280	BS	Elective subjects	5.0	Bachelor	Information systems	4	2	Introduction to artificial intelligence Introduction to machine learnin	Fundamentals of Scientific Research in the Field of Information Technology	Multidimensional data view. Methods and algorithms for solving the main tasks of data analysis: classification, clustering, etc. The practical application of Data Mining in industries. Methods and models of data mining. Methods of statistical analysis and modeling, focused on finding models and relationships, hidden in the data set.	To formulate and solve artificial intelligence tasks, including decision support tasks, to use knowledge engineering methods, and the capabilities of artificial intelligence systems in applications.	Intelligent data analysis

The catalog of elective disciplines was reviewed and approved the Institute council, protocol №1 "02" 09 2025y.

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