S.Seifullin Kazakh Agrotechnical Research University, 2025 year

Confirm
Acting Director of the Institute Business and Digital Technologies
Sabyrova M.E.
« » 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»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Python and data analysis (Minor)	PADM 2298	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Algorithms, data structures and programming Object-oriented programming (C #, Java)	Programming in Python	During the course, students are introduced to the rapidly developing field of data analysis with a special focus on the Python programming language. Students will learn the concepts, methods and tools they need in order to draw meaningful conclusions based on the analysis of real economic data. The course is specially designed for people with no prior programming experience.	Make informed decisions in various fields using the Python programming language for data analysis.	Digital circuitry and architecture of computer
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Digital circuitry and architecture of computer	CSAK 2291	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Information and communication technologies Object-oriented programming (C #, Java)	Software development technologies and standards	Fundamentals of the algebra of logic. Basic logic elements. Decoders, encoders, code converters. Purpose and principle of operation of multiplexers. Purpose of digital comparators. Theorem de Morgana. The scheme and principle of operation of digital comparators. Purpose and principle of operation adders. Truth tables of adders.	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	Python and data analysis (Minor)
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Programming in Python	PYaP 2259	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Mathematical foundation of information technologies Algorithms, data structures and programming Machine-Oriented C / C ++ Programming	Fundamentals of Scientific Research in the Field of Information Technology	Features of the Python language. Data types, operations, operators. Input/Output features. Built-in object types: numbers, strings, tuples, lists, dictionaries, sets. File Input/Output. Reading lines with file iterators. Working with binary files. The numpy library for implementing mathematical objects and calculations. Functions and recursion. Range function. Sorting. Lambda functions.	Development, describe and explain the algorithm for solving the problem, determine the problem structure: linear, branched and cyclical; interpret the data structure: lists, arrays, sets, files, strings, etc. Explain, select and use "top-down" and "bottom-up" programming techniques, have practical programming skills in one of the programming languages, apply programming knowledge for developing applications. Analyze tasks, determine solutions and select efficient algorithms for task implementation. Define input and output data. Understand the integrity	Modern programming languages

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Modern programming languages	SYaP 2287	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Algorithms, data structures and programming Machine-Oriented C / C ++ Programming Object-oriented programming (C #, Java)	Fundamentals of Scientific Research in the Field of Information Technology Software development technologies and standards	Modern object-oriented programming languages. The interaction of programs with the OS and modular programming. Features of programming in multiprogram and multitasking environments. Programming Windows applications.	determine the language tool for solving problems and process information using the tools of programming languages and application programs 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 to carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT	Programming in Python
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Applied statistical analysis (Minor)	PSAM 2299	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Probability and Statistics in Computer Science	Python and data analysis (Minor) Statistical methods of data analysis Statistics for IT.	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.	Apply statistical methods to analyze data, make informed decisions, and solve practical problems in various fields.	Programming for IoT
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Programming for IoT	PDI 2283	BS	Elective subjects	5.0	Bachelor	Information systems	2	By student's option	Algorithms, data structures and programming Digital circuitry and architecture of computer	Server virtualization and containerization technologies	Arduino and feature set, EEPROM library, Connecting the keyboard and mouse Arduino and touch panel, temperature sensors, humidity, gas, etc. Network communication using Arduino, Arduino and memory cards, LED arrays, Radio Frequency Identification (RDIF).	Determine the language tool for solving problems and process information using the tools of programming languages and application programs. 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. Use technologies, principles of organization and functioning of the Internet, analyze threats to information security. Evaluate and select modern operating environments and ICT for informatization and automation of solving applied problems and creating IS. Plan the work of an IT project, take part in the implementation, adaptation and customization of software and applied.	Applied statistical analysis (Minor)

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Professionally-oriented Foreign Language	POIYa 3273	BS	Elective subjects	3.0	Bachelor		3	By student's option	Foreign language	Statistical methods of data analysis	Forms the professional foreign language speech of future specialists to increase the level of professional competence, proficiency in a professional foreign language for the implementation of written and oral information exchange, further development of speech activity. Rules of speech behavior in accordance with situations of professional communication, depending on the style and nature of communication in the social, household and academic spheres.	Use communication in oral and written forms in the state, Russian and foreign languages to solve professional problems of interpersonal and intercultural interaction.	Basics of anti-corruption culture, Ecology, life safety principles and SDG
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Ecology, life safety principles and SDG	EOBZhC 3297	BS	Elective subjects	3.0	Bachelor	Ecology	3	By student's option	Physics	Engineering graphics (AutoCad, Compas)	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, Professionally-oriented Foreign Language
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Basics of anti-corruption culture	OAK 3296	BS	Elective subjects	3.0	Bachelor	Economics, Management and Marketing	3	By student's option	Economics, Law and Finance in Entrepreneurship	Statistical methods of data analysis	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, Professionally-oriented Foreign Language

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Database technologies	TBD 3284	BS	Elective subjects	5 0	Bachelor	Information systems	3	By student's option	Database Network operating systems	Server virtualization and containerization technologies Information Security	Purpose and basic principles of database management systems architecture. Theoretical bases of relational database management systems. Using the SQL language in application programs. The concept of an active database. Stored procedures and triggers. Basic principles of database structure design. Fundamentals of transactional processing in database management systems. Security of database management systems. Elements of DataWarehousing technology	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 methods and means of organizing calculations in network systems, methods and means of organizing databases and knowledge bases in computer systems and networks, control and operation of hardware and software apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels to carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT	Modern database technology (Oracle)
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Modern database technology (Oracle)	STBDO 3262	BS	Elective subjects	5.0	Bachelor	Information systems	3	By student's option	Database Network operating systems	Server virtualization and containerization technologies Information Security	Modern database technologies. Purpose and basic principles of database management systems architecture. Theoretical bases of relational database management systems. Using the SQL language in application programs. The concept of an active database. Stored procedures and triggers. Basic principles of database structure design. Fundamentals of transactional processing in database management systems. Security of database management systems. Elements of DataWarehousing technology.	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 methods and means of organizing calculations in network systems, methods and means of organizing databases and knowledge bases in computer systems and networks, control and operation of hardware and software apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels to carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT	Database technologies
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Software development technologies and standards	TSRPO 3275	BS	Elective subjects	5.0	Bachelor	Information systems	3	By student's option	Software development technologies and standards	Design and architecture of software systems	The main stages in the development of software development technology. Evolution of software life cycle models. Standards governing the software development process. Requirements development and external software	determine the language tool for solving problems and process information using the tools of programming languages and application programs solve problems of varying complexity using programming technology,	Tools and programming

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Tools and programming	ISRP 3288	BS	Elective subjects	5.0	Bachelor	Information systems	3	By student's option	Design and development of mobile application	Simulation modeling Parallel programming	Types of software development methodologies, depending on life-cycle models. cascading, iterative (1-RUP; 2 — flexible methodologies: SCRUM, KANBAN, DSDM, MSF, ALM, XP. RAD approach. Logical program design stage. System approach. Conceptual model. Subject area. Graphical, simulation, executable and / or functional behavioral, informational models. Types of software development approaches: structural, object oriented. Methods for modeling business 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 methods and means of organizing calculations in network systems, methods and means of organizing databases and knowledge bases in computer systems and networks, control and operation of hardware and software. Represent IT projects, maintaina culture of academic honesty, critically evaluate and interpret information in the field of ICT, economics and law. Apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels. To carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT. Use technologies, principles of organization and functioning of the Internet, analyze threats to information security. Evaluate and select modern operating	Software development technologies and standards
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Internet technologies and e-commerce	ITEK 3261	BS	Elective subjects	5.0	Bachelor	Information systems	3	By student's option	Network operating systems Network technologies Web development	Design and architecture of software systems	Internet technologies and e-commerce as an integral part of electronic business. Organizational and technological foundations of e-commerce on the Internet. Characteristics of objects and subjects of electronic commerce. E-commerce in the consumer market for goods and services: business-to-consumer technologies. Organization of interfirm interaction in e-commerce processes: business-to-business technologies. Features of mobile and television commerce. Problems and prospects for the development of e-commerce in Kazakhstan.	The ability to collect, process, economic and statistical, mathematical analysis of data, to present the results of their own research in the form of analytical reports, reviews, theses, presentations, recommendations; use the tools of marketing research when choosing the organizational structure of the electronic marketing service; making calculations to optimize the product range, distribution system, product distribution and promotion; assess the effectiveness of marketing activities, develop economically sound recommendations. The ability to effectively use software applications, modern digital platforms, technologies, be able to adapt technical data processing tools for building distribution channels and delivering products to the final customer, organizing sales and customer service.	Internet application development

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Internet application development	RIP 3293	BS	Elective subjects	5 0	Bachelor	Information systems	3	By student's option	Development and analysis of software requirements Design and development of mobile application	Visual programming and data mining Parallel programming	Technologies of using web programming languages in client applications; technologies of application Node JS in server applications, use of web development tools; the use of modern web technologies for creating Internet applications. Layouts on CMS (Tilda, WordPress, Bitrix, Opencard). SEO principles.	Determine the language tool for solving problems and process information using the tools of programming languages and application programs. Apply methods and means of organizing calculations in network systems, methods and means of organizing databases and knowledge bases in computer systems and networks, control and operation of hardware and software Represent IT projects, maintaina culture of academic honesty, critically evaluate and interpret information in the field of ICT, economics and law. Apply application area analysis methods at the conceptual, logical, mathematical and algorithmic levels. To carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT. Use technologies, principles of organization and functioning of the Internet, analyze threats to information security. Evaluate and select modern operating environments and ICT for informatization and automation of solving applied problems and creating IS. Plan the work of an IT project, take part in the implementation, adaptation and customization of software and applied.	Internet technologies and e-commerce
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Introduction to artificial intelligence	VII 4279	BS	Elective subjects	7.0	Bachelor	Information systems	4	By student's option	Machine-Oriented C / C ++ Programming Programming in Python	Neural networks and their applications Basics of neural networks	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.	determine the language tool for solving problems and process information using the tools of programming languages and application programs 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 use technologies, principles of organization and functioning of the Internet, analyze threats to information security	Machine learning technology

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Machine learning technology	TMO 4285	BS	Elective subjects	7.0	Bachelor	Information systems	4	By student's option	Python and data analysis (Minor) Server virtualization and containerization technologies	Neural networks and their applications Basics of neural networks	Logical models of machine learning. Ranking trees. Learning ordered lists of rules. Learning unordered rule sets. Learning rule-based descriptive models. Probabilistic training models Probabilistic models of categorical data Discriminant learning by optimizing conditional likelihood. Probabilistic models with hidden variables. Compression based models. Metric models.	Determine the language tool for solving problems and process information using the tools of programming languages and application programs. 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. Evaluate and select modern operating environments and ICT for informatization and automation of solving applied problems and creating IS. Plan the work of an IT project, take part in the implementation, adaptation and customization of software and applied.	Introduction to artificial intelligence
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Statistical methods of data analysis	SMAD 4266	BS	Elective subjects	5.0	Bachelor	Information systems	4	By student's option	Mathematical foundation of information technologies Probability and Statistics in Computer Science	Specialized Mathematical Packages Mathematical modeling of technical systems in MatLab	Multi-dimensional samples. Preliminary analysis of multidimensional data. Methods for modeling random variables. Robust statistical estimation. Methods of statistical estimation and comparison of samples. Non-parametric methods for testing sample homogeneity. Dispersion analysis. Methods for processing rank data. Component analysis. Methods for multidimensional data classification	Determine the language tool for solving problems and process information using the tools of programming languages and application programs. 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. Evaluate and select modern operating environments and ICT for informatization and automation of solving applied problems and creating IS.	Statistics for IT

B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Statistics for IT	SDI 4290	BS	Elective subjects	5.0	Bachelor	Information systems	4	By student's option	Mathematical foundation of information technologies Probability and Statistics in Computer Science	Specialized Mathematical Packages Mathematical modeling of technical systems in MatLab	Methods of statistical description of the results of observations. Fundamentals of correlation analysis. Fundamentals of regression analysis. Solution of typical examples. Fundamentals of dispersion analysis. Nonparametric methods of statistics.	Determine the language tool for solving problems and process information using the tools of programming languages and application programs. 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. Evaluate and select modern operating environments and ICT for informatization and automation of solving applied problems and creating IS.	Statistical methods of data analysis
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Mathematical modeling of technical systems in MatLab	MMTSM 4257	BS	Elective subjects	5.0	Bachelor	Information systems	4	By student's option	Fundamentals of Scientific Research in the Field of Information Technology Applied statistical analysis (Minor) Programming for IoT	Professional practices	The essence of computer simulation of a complex system. Architectural construction of modeling systems of dynamic systems. Modeling and analysis of dynamic processes in technical devices by the method of equivalent circuits. Functional modeling of technical systems.	determine the language tool for solving problems and process information using the tools of programming languages and application programs 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 to carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT	Specialized Mathematical Packages

B057 - «Information technology».	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Specialized Mathematical Packages	SMP 4286	BS	Elective subjects	5 0	Bachelor	Information systems	4	By student's option	Fundamentals of Scientific Research in the Field of Information Technology	Professional practices	Modern mathematical software: main types, possibilities, applications. Programming languages and libraries of programs for numerical calculations. Specialized and universal mathematical packages. Approaches to interface organization, command language. Computer algebra systems and universal numerical calculation systems (Mathematica, Maple, Matlab, Mathcad). Open source math packages (Octave, Scilab, Sage, Axiom, Maxima).	determine the language tool for solving problems and process information using the tools of programming languages and application programs 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 to carry out professional communication in various forms in Kazakh, Russian and foreign languages to solve professional problems in the field of ICT	Mathematical modeling of technical systems in MatLab
B057 - «Information technology»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Basics of neural networks	ONS 4289	BS	Elective subjects	5 0	Bachelor	Information systems	4	By student's option	Introduction to artificial intelligence Machine learning technology	Professional practices	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»	6B06101 - «Software engineering»	Full-time (bachelor 4 years) semester	Neural networks and their applications	NSIP 4278	BS	Elective subjects	5.0	Bachelor	Information systems	4	By student's option	Introduction to artificial intelligence Machine learning technology	Professional practices	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 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

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

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