NJSC «KAZAKH NATIONAL WOMEN TEACHER TRAINING UNIVERSITY»
INSTITUTE OF PHYSICS, MATHEMATICS AND DIGITAL TECHNOLOGY
6B06101-Design of digital analytical educational systems
Catalog of elective disciplines

CONTENT

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1. OPTIONAL COMPONENTS OF THE CYCLE OF GENERAL COURSES

Component of choice 1

Course: **Fundamentals of legal literacy and anti-corruption culture**
Intensity of the Course: 5 academic credits
Module code: **GES 106/1**
Module name: Spiritual, moral, socio-cultural and physical education
Prerequisites: Fundamentals of Law (school course)
Purpose: Formation of a legally literate, law-abiding person, who knows his rights and responsibilities, intolerant of any manifestations of corruption
Short description: The course is aimed at developing a legally literate, law-abiding person who knows his rights and responsibilities and is intolerant of any manifestations of corruption. Legal and anti-corruption culture is instilled through the study of the laws of the Republic of Kazakhstan, as well as anti-corruption legislation and issues of legal liability for corrupt acts.
Learning outcomes for EP (LOP):
LOP 1 - Understands business and legal culture, is ready for innovative and volunteer activities, is not indifferent to global problems and has soft skills, brought up in the national spirit;
Discipline learning outcomes (LOC):
LOC 1 - know the meaning and role of legal culture in the life of society, its relationship with the political culture of the individual and the basic definitions of corruption;
LOC 2 - analyze the main obstacles to ensuring inalienable human rights; the role of human rights in personal life and in the life of society;
LOC 3 - apply the acquired knowledge in political analysis, in the activities of government bodies, political and public organizations, analyze problems related to corruption and counteraction to it;
LOC 4 - be capable of dialogue as a way of relating to legal culture and society.
Post-requisites: No

Component of choice 1

Course: **Fundamentals of ecology and safe living**
Intensity of the Course: 5 academic credits
Module code: **GES 106/2**
Module name: Spiritual, moral, socio-cultural and physical education
Prerequisites: Biology, Geography (school curriculum)
Purpose: Preserving the stability of life by analyzing environmental processes, forming priority directions and setting specific tasks for nature conservation.
Short description: The discipline forms in students modern environmental education and culture, develops skills in applying methods to improve the safety of technical equipment and technological processes for safe life. Reveals the basic patterns of functioning of ecosystems at various levels of organization, the biosphere as a whole, contradictions that arise in the relationship between man and nature, as well as the need for careful treatment of nature and ecology.
Learning outcomes for EP (LOP):
LOP 1 - Understands business and legal culture, is ready for innovative and volunteer activities, is not indifferent to global problems and has soft skills, brought up in the national spirit;

Discipline learning outcomes (LOC):

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LOC 1 - Knows the terms and concepts that define the main features and characteristics of ecosystems. Knows the terms and concepts that define the main features and characteristics of ecosystems.

LOC 2 - Has an understanding of the complex relationships that occur in nature, as well as between society and nature.

LOC 3 - Can provide an environmental assessment of the situation in the region and promote the knowledge gained from working in all areas of its activities.

LOC 4 - Can analyze basic legislative documents on environmental safety and modern environmental problems.

Post-requisites: No

Component of choice 1

Course: **Fundamentals of Economics and Entrepreneurship**
Intensity of the Course: 5 academic credits
Module code: **GES 106/3**
Module name: Spiritual, moral, socio-cultural and physical education
Prerequisites: Fundamentals of Entrepreneurship and Business (school course)
Purpose: IntLOCucing students to the basics of economics and entrepreneurship, mastering the conceptual apparatus and basic forms of doing business.
Short description: The discipline is focused on developing students' entrepreneurship and business thinking skills. Through a comprehensive presentation of the patterns of economic functioning, the conditions for entrepreneurial activity, its internal and external environment, students will develop the skills to develop a business plan, create and successfully run their own business.
Learning outcomes for EP (LOP):
LOP 1 - Understands business and legal culture, is ready for innovative and volunteer activities, is not indifferent to global problems and has soft skills, brought up in the national spirit;
Discipline learning outcomes (LOC):
LOC 1 - know the basic concepts in the field of economics and business activity;
LOC 2 - be able to find and use the necessary economic information; determine the organizational and legal forms of organizations;
LOC 3 - determine the composition of the organization's material, labor and financial resources;
LOC 4 - evaluation of a business idea and development of a business plan.
Postrequisites: No

Component of choice 1

Course: **Leadership Fundamentals and Innovation Sensitivity**
Intensity of the Course: 5 academic credits
Module code: **GES 106/4**
Module name: Spiritual, moral, socio-cultural and physical education
Prerequisites: No
Purpose: In the process of studying the discipline, the student develops the skills of setting goals and objectives, timely planning of group work, problem solving, a sense of responsibility and effective communication.

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Short description: The course contributes to the disclosure and development of leadership qualities in the personality of each student, the development of innovative sensitivity skills, as a process of adaptation to innovations caused by innovative processes, as well as the use of the results of scientific and technical processes in their life and professional activities. Studies the current state and prospects for the development of leadership qualities and the human factor in management.

Learning outcomes for EP (LOP):

LOP 1 - Understands business and legal culture, is ready for innovative and volunteer activities, is not indifferent to global problems and has soft skills, brought up in the national spirit;

Discipline learning outcomes (LOC):

LOC 1 – understands theoretical and applied research in the field of modern management achievements in the Republic of Kazakhstan and abroad using modern scientific methods

LOC 2 – knowswork effectively individually and in a team

LOC 3 – independently studies and continuously improves qualifications throughout the entire period of professional activity.

LOC 4 – applies professional knowledge in the field of organizational and management activities.
Postrequisites: No

Component of choice 1

Course: **Emotional intellect**
Intensity of the Course: 5 academic credits
Module code: **GES 106/5**
Module name: Spiritual, moral, socio-cultural and physical education
Prerequisites: No
Purpose: Knowledge and ability to apply modern methods of diagnosing and developing students' emotional intelligence and soft skills, including in the distance learning format.

Short description: Emotional intelligence and organizational culture. The concept of group emotional intelligence quotient. Emotional management. Emotional intelligence and building effective teams. Development of staff emotional intelligence. A systematic approach to the implementation of emotional intelligence in Kazakh and foreign organizations: creation of an emotionally intelligent system of personnel motivation, formation of team spirit, conflict management, feedback procedure. The structure of emotional intelligence. Types of intelligence. Intellectual (IQ) and emotional competence (EQ) and their role in achieving success. Modern technologies for training and developing the emotional intelligence of personnel (training, coaching, mentoring).

Learning outcomes for OP (LOP):

LOP 1 - Understands business and legal culture, is ready for innovative and volunteer activities, is not indifferent to global problems and has soft skills, brought up in the national spirit;

Discipline learning outcomes (LOC):

LOC 1 - modern methods and technologies for organizing educational activities, taking into account the development of soft skills, diagnostics and assessment of soft skills, the formation of individual educational directions and methods for organizing group activities.

LOC 2 - application of modern methods and technologies for organizing educational activities, taking into account the development of flexible skills, including in the digital environment.

LOC 3 - soft skills on the skillfolio platform have the ability to conduct comprehensive diagnostics of soft skills, interpret the results and develop them in both individual and group forms of training.

Postrequisites: No

Component of choice 1

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Course: Basics of mathematical statistics
Intensity of the Course: 5 academic credits
Module code: **GES 106/6**
Module name: General education module
Prerequisites: No

Purpose: Studying historical events and phenomena from ancient times to the 21st century, our national culture on the basis of scientifically proven facts, increasing the level of knowledge of future specialists, strengthening professional skills, forming historical consciousness based on new Kazakhstani patriotism and national values. As well as the importance of the history of the Great Steppe and the formation of the position of young people who respect national culture.

Short description: The discipline is aimed at nurturing the national spirit, respect for history and national traditions in modern Kazakh ladies. The course covers the features of the cultural worldview and perception of the world by the Turks, the national code of the Kazakh people, the historical and social foundations of their culture and cultural values, as well as moral teachings in the Great Steppe and the social foundations of the national idea.

Learning outcomes for EP (LOP):

LOP 1 - Uses various communication formats, taking into account sociocultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to use them for the development of teams

Discipline learning outcomes (LOC):

LOC 2 – Uses mathematical tools to solve applied computer science problems

LOC 4 – Possesses the skills of independent work and the use of computer programs and mathematical tools for solving applied computer science problems

Post requisites: Module of socio-political knowledge (sociology, cultural studies, political science, psychology)

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2. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Component of choice 1

Course: **Higher Mathematics**
Intensity of the Course: 5 academic credits
Module Code: **FSCI 102/1**
Module Name: Fundamental Science
Prerequisites: Algebra and geometry (school course)
Purpose: The development of algorithmic skills in solving formalized problems, the study of mathematical methods for the study of functional systems, obtaining the fundamental mathematical training necessary to study the disciplines of the economic cycle related to future professional activities.
Short Description: In the course, students will master the mathematical apparatus for the main sections of the course of mathematics in high school: mathematical analysis and differential equations, probability theory and mathematical statistics. Forms the ability to apply mathematical methods to solve practical problems with the help of computer mathematics systems, as well as the ability to apply probabilistic and statistical methods to the evaluation of the accuracy of measurements and tests.
Learning Outcomes in EP (LOP):
LOP 6 – Designs and analyzes software using modern algorithmic and mathematical methods.
LOP 9 – Uses digital literacy and interdisciplinary knowledge in solving professional problems and determines the cause-and-effect relationships of natural science processes and phenomena.*Learning*
Learning Outcomes in Course (LOC):
LOC 1 – Has knowledge of the basics of linear algebra and analytical geometry
LOC 2 – Uses mathematical tools to solve applied computer science problems
LOC 3 – Uses methods of differential calculus to solve practical problems
LOC 4 – Has the skills of independent work and use of computer programs mathematical tools for solving applied problems in computer science
Post requisites: Discrete Mathematics and Mathematical Logic

Component of choice 1

Course: **Linear Algebra and Analytical Geometry**
Intensity of the Course: 5 academic credits
Module Code: **FSCI 102/2**
Module Name: Fundamental Science
Prerequisites: Algebra and geometry (school course)
Purpose: Acquaintance of students with the basic concepts, tasks and methods of analytical geometry and linear algebra, as well as their role and use in other mathematical and special disciplines, practical applications.
Short Description: The goal of this course is to develop mathematical intuition, education of mathematical culture, mastering the logical foundations of the course. As a result of studying the discipline, the student must know the basics of linear algebra and analytical geometry; be able to apply methods of linear algebra and analytical geometry to solve practical problems; to possess methods of linear algebra and analytical geometry.
Learning Outcomes in EP (LOP):
LOP 6 – Designs and analyzes software using modern algorithmic and mathematical methods.
LOP 9 – Uses digital literacy and interdisciplinary knowledge in solving professional problems and determines the cause-and-effect relationships of natural science processes and phenomena.*Learning*
Learning Outcomes in Course (LOC)Outcomes:

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LOC 1 – Has knowledge of the basics of linear algebra and analytical geometry

LOC 2 – Solves typical mathematical problems

LOC 3 – Uses mathematical language, algebraic and geometric methods

LOC 4 – Applies methods of linear algebra and analytical geometry to solve mathematical and applied computer science problems

LOC 5 – Applies the basic laws of natural science disciplines in professional activities

*Post requisites:*Discrete mathematics and mathematical logic

Component of choice 2

Course: **Discrete Mathematics and Mathematical Logic**

Intensity of the Course: 6 academic credits

Module Code: **FSCI 203/1**

Module Name: Fundamental Science

*Prerequisites:*Algebra and geometry, Higher Mathematics

*Purpose:*to acquaint students with the beginnings of mathematical logic and the main sections of discrete mathematics, and their applications, to prepare them theoretically and practically for the perception of other disciplines.

Short Description: This course is aimed at forming the students' idea of modern algebra as the main theoretical foundation of discrete mathematics; to form an idea about mathematical concepts and methods, which allow you to simulate discrete phenomena and discrete processes of the surrounding world; to form an idea of setting problems in the field of discrete mathematics and skills of description of discrete objects in applied problems.

Learning Outcomes in EP (LOP):

LOP 6 – Designs and analyzes software using modern algorithmic and mathematical methods.

LOP 9 – Uses digital literacy and interdisciplinary knowledge in solving professional problems and determines the cause-and-effect relationships of natural science processes and phenomena.

Learning Outcomes in Course (LOC):

LOC 1 – can solve problems of a theoretical and applied nature from various sections of discrete mathematics and mathematical logic, prove statements, build models of objects and concepts.

LOC 2 – owns the mathematical apparatus of discrete mathematics and mathematical logic, methods of proving statements in this area, the skills of algorithmic basic problems.

LOC 3 – demonstrates the ability and readiness to solve problems of a theoretical and applied nature from various branches of discrete mathematics and mathematical logic, to prove statements, to build models of objects and concepts.

*Post requisites:*Mathematical and Computer Modeling

Component of choice 2

Course: **Probability Theory and Mathematical Statistics**

Intensity of the Course: 6 academic credits

Module Code: **FSCI 203/2**

Module Name: Fundamental Science

Prerequisites: Algebra and geometry, Higher Mathematics

Purpose: the formation of students' scientific ideas about the essence and properties of probabilistic processes that describe their probabilities, random variables, distribution functions and statistical methods, mastering practical skills of working with random variables and methods of their search and evaluation.

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Short Description: This course is aimed at the formation of basic knowledge and basic skills in the theory of probabilities necessary for solving problems arising in the mathematical support of applied activities; the formation of students' theoretical and probabilistic apparatus, necessary for solving theoretical and applied problems; formation of conceptual theoretical and probabilistic base and level of algebraic preparation necessary for understanding the bases of mathematical statistics and its application.

Learning Outcomes in EP (LOP):

LOP 6 – Designs and analyzes software using modern algorithmic and mathematical methods.

LOP 9 – Uses digital literacy and interdisciplinary knowledge in solving professional problems and determines the cause-and-effect relationships of natural science processes and phenomena.

Learning Outcomes in Course (LOC):

LOC 1 – Knows how to find the probability of a random event, parameters of random variables, characteristics of distributions and samples;

LOC 2 – Fluent in the terminology and notation of probability theory and mathematical statistics.

LOC 3 – Able to solve problems of constructing the simplest probabilistic model, the studied process or phenomenon on the basis of statistical data.

Post requisites: Mathematical and Computer Modeling

Component of choice 3

Course: **Client-server Technologies**
Intensity of the Course: 5 academic credits
Module Code: **ISDMS 202/1**
Module Name: Information security and database management system
Prerequisites: Educational Data Mining
Purpose: the study by students of the fundamental principles of application work in the client-server architecture; mastering technologies for storing and processing data in systems of client-server architecture.

Short Description: The course is aimed at studying the technology "Client-server", the principle of distributed database, the positive and negative sides of the architecture "Client-server", are introduced to distributed database models; examples of client-server application developmentserver with SQL; learning transactions and locks..

Learning Outcomes in EP (LOP):

LOP 3 – Develops computer and mobile applications according to the requirements of modern education using high-level programming languages

LOP 4 – Uses artificial intelligence approaches, methods of analysis and processing of big data to solve professional problems in the specialty.

Learning Outcomes in Course (LOC):

LOC 1 – knows the basic concepts of the DBMS client-server architecture, typical tasks performed when creating server databases and their administration;

LOC 2 – Uses specialized software tools for the development of client-server software

LOC 3 – knows the SQL language for creating and administering multi-user databases and server-side business logic objects

Post requisites: Design of information systems, Analytical software

Component of choice 3

Course: **BigData**
Intensity of the Course: 5 academic credits
Module Code: **ISDMS 202/2**

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Module Name: Information security and database management system
Prerequisites: Educational Data Mining
Purpose: formation of theoretical knowledge and practical skills in the field of methodology, processing and analysis of big data
Short Description: Discipline examines in-depth insights into big data technologies, their features and prospects in practice. The course consists of interconnected blocks, which will present both technological and economic features of the use of big data technologies, options for building the necessary infrastructure for specific use. The practical application of big data technologies using different tools.
Learning Outcomes in EP (LOP)
LOP 4 – Uses artificial intelligence approaches, methods of analysis and processing of big data to solve professional problems in the specialty.
LOP 8 – Manages IT projects, computing and information systems in the course of professional activity, applies methods of information data protection.
Learning Outcomes in Course (LOC)
LOC 1 – Knows the basic concepts and principles of Big Data technology
LOC 2 – Defines arrays of big data
LOC 3 – Possesses knowledge of data storage and processing
LOC 4 – Analyzes big data clusters
LOC 5 – Possesses the skills of working with hardware and software for processing big data
Post requisites: IT project management

Component of choice 4

Course: **Web Application Programming**
Intensity of the Course: 5 academic credits
Module Code: **PLT 304/1**
Module Name: Programming Languages and Technologies
Prerequisites: Information and Communication Technologies (in English)
Purpose: An introduction to the basics of web programming, developing a personal web application by working with various programming environments.
Short Description: The course includes basic knowledge of web programming, including CSS, plug-ins, scripts, basic data access and application hosting. This course will teach students how to work with HTML5, CSS, JavaScript programming language and the popular jQuery framework. As a result, students will prepare their individual digital projects - a full-fledged hosting site and a web application with adaptive typesetting.
Learning Outcomes in EP (LOP):
LOP5 – designs web applications and educational systems with an ergonomic user interface based on flexible methodology and network security principles.
LOP6 – designs and analyzes software using modern algorithmic and mathematical methods
Learning Outcomes in Course (LOC):
LOC 1 - CSS, plugins, scripts, basic data access;
LOC 2 -Working with HTML5, CSS, JavaScript programming language and jQuery framework;
LOC 3 -Development of individual digital projects (web applications).
Postrequisites: Web Analytics

Component of choice 4

Discipline: **Methods for Developing Web Applications**

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Intensity of the Course: 5 academic credits

Module code: **PLT 304/2**

Module name: Programming Languages and Technologies.

Prerequisites: Designing algorithms, Client-server Technologies.

Purpose: give a systematic review of modern approaches and technologies for developing web applications, study and master the ways of developing web applications using various technologies.

Short description: The course allows to study methods of architecture design and integration. Learning from the basics, what is the Internet and why it is needed, and then gradually turns to complex topics. In the course students will get acquainted with the principles of building the architecture of web services, the diversity of integration through the API and through message brokers. Students will learn a wide range of concepts of integration design with the help of APIs and messaging brokers, about which you need to know.

Learning Outcomes in EP (LOP):

LO6 – Uses physical and mathematical apparatus, Computer science theory, computer modeling methods, computational and experimental research methods in the process of professional activity.

LO7 – Uses high-level programming languages to create computer, mobile (on IOS and Android platforms) applications and software prototypes for solving applied problems.

LO8 – Applies network resources and software tools for developing networks and web applications in professional activities.

Learning Outcomes in Course (LOC):

LOC1 - Solves applied problems using information and communication technologies

LOC2 - Knows the basics of website design and design technology and the main approaches to the development of web applications

LOC3 - Programs sites with various software tools

LOC4 - Has practical skills in creating, debugging and deploying web applications using various programming systems

Post requisites: Web Analytics.

Component of choice 5

Course: **Computer network design**

Intensity of the Course: 5academic credits

Module Code: **CNM 301/1**

Module Name: Computer networks and modeling

Prerequisites: Information and Communication Technologies (in English)

Purpose: knowledge of modern and promising principles, methods and technologies for designing computer systems, networks and elements.

Short Description: The course covers the basic concepts and definitions of computer networks: components, network topology, network functions, protocols, stacks, OSI protocol set, network architecture. Technologies of network design and their hardware. During the course, students will master the skills of creating a local computer network, learn to apply in practice the general principles of networking, perform network diagnostics.

Learning Outcomes in EP (LOP):

LO 5 – designs web applications and educational systems with an ergonomic user interface based on flexible methodology and network security principles.

LO 8 – manages IT projects, computing and information systems in the course of professional activity, applies methods of information data protection.

Learning Outcomes in Course (LOC):

LOC 1 - To design the cable structure of a computer network;

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LOC 2 -To make the choice of technology, tools and computer equipment in the organization of the process of development and research of objects of professional;

LOC 3 -To ensure the protection of information in the network using software and hardware;

LOC 4 - configure the TCP/IP protocol and use the built-in operating system utilities to diagnose the network health;

LOC5 - Meet the requirements of regulatory and technical documentation, have experience in the design of project documentation.

Post requisites: no

Component of choice 5

Discipline: **Computer Networks and Cloud Technologies**
*Intensity of the Course:*5 academic credits
Module code: **CNM 301/2**
Module name: Computer networks and modeling
Prerequisites: Information and Communication Technologies (in English)
Purpose: students study the basic principles of operation of applications in a client-server architecture; development of data storage and processing techniques in a client-server architecture systems.
Short description: This course will teach the principles of operation and construction of computer networks and applications of cloud technologies in solving professional problems. Will master the purpose of protocols and technology of data transfer in networks and cloud technology.

Learning Outcomes in EP (LOP):

LO6 – Uses physical and mathematical apparatus, Computer science theory, computer modeling methods, computational and experimental research methods in the process of professional activity.

LO8 – Applies network resources and software tools for developing networks and web applications in professional activities.

Learning Outcomes in Course (LOC):

LOC 1 - Uses interdisciplinary knowledge and theory of informatics in solving applied problems

LOC 2 - Knows the basics of new information technologies for the development of client-server software

LOC 3 - Uses specialized software tools for the development of client-server software

LOC 4 - Possesses the skills of creating configurations of client-server software

Post requisites: Design of Information Systems

Component of choice 6

Course: **Modeling and design in education**
Intensity of the Course: 5academic credits
Module Code: **CNM 202/1**
Module Name: Computer networks and modeling
Prerequisites
*Purpose:*Training in polygonal 3D modeling technologies, the formation of basic practical skills in AutodeskMaya.
Short Description: The course covers the basics of polygonal 3D modeling, technologies, types and methods. Students will get to know the world of 3D technologies and learn basic practical skills at AutodeskMaya.
Learning Outcomes in EP (LOP):

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LOP 7 – develops digital analytical educational systems using modern methods of system and visual programming

LOP 9 -Uses digital literacy and interdisciplinary knowledge in solving professional tasks and determines the cause-and-effect relationships of natural science processes and phenomena.

Learning Outcomes in Course (LOC):

LOC 1 - Formation of the basic concept of 3D modeling technologies.

LOC 2 -Working with sources of information about technologies, types and methods of 3D modeling

LOC 3 -Formation of practical skills in AutodeskMaya.

Postrequisites: IT Project Management

Component of choice 6

Course: **Mathematical and Computer Modeling**

Intensity of the Course: 5academic credits

Module Code: **CNM 202/2**

Module Name: Computer networks and modeling

Prerequisites: Digital Technologies in Education

Purpose: Principles of computer modeling of mathematical problems, the use of the Maple computer system and the development of methods for building programs in the Maple environment.

Short Description: The course forms at students the basic concepts on modeling, by types and classifications of models, the ability to represent the model in mathematical and algorithmic form, i.e. with methods of formalization of objects, processes, phenomena and their implementation on the computer. And students will learn to solve mathematical problems, build graphs, etc. with the help of the computer system Maple, apply various models and algorithms of model construction. Moreover, students will acquire the skills of building simulation models of information processes.

Learning Outcomes in EP (LOP):

LOP 6 - designs and analyzes software using modern algorithmic and mathematical methods

LOP 9 -uses digital literacy and interdisciplinary knowledge in solving professional tasks and determines the cause-and-effect relationships of natural science processes and phenomena.

Learning Outcomes in Course (LOC):

LOC 1 - knows the concept and classification of models and various methods of constructing mathematical models;

LOC 2 -knows the possibilities of using the Maple system in computer modeling of mathematical problems;

LOC 3 -knows and is able to apply the basic principles of working in the Maple computer system and basic information about Maple packages;

LOC 4 - knows how to create programs for solving mathematical problems, geometry and linear algebra problems, etc. in the Maple environment and knows the graphical capabilities of the Maple system.

Post requisites: Design of Information Systems

Component of choice 7

Course: **Machine Learning**

Intensity of the Course: 5 academic credits

Module Code: **DAET 202/1**

*Module Name:*Digital analytical educational technologies

*Prerequisites:*Information and Communication Technologies (in English)

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Purpose: introduce students to the theoretical foundations and algorithms of machine learning, their possible practical implementations and application in solving real problems.

Short Description: This program consists of courses that provide a thorough theoretical understanding and significant practice of basic algorithms, how to use them and best practices related to machine learning in Python. Will learn to prepare quality data for further processing with the adoption of machine learning methods. Students will study the libraries NumPy, Pandas, Matplotlib, Seaborn, Scikit-Learn and more. Will master the methods of machine learning in practice.

Learning Outcomes in EP (LOP):

LOP 4 – Uses artificial intelligence approaches, methods of analysis and processing of big data to solve professional problems in the specialty.

LOP 8 – Manages IT projects, computing and information systems in the course of professional activity, applies methods of information data protection.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the capabilities of current machine learning algorithms that are widely used in practice, the main areas of their application;

LOC 2 – Knows how to apply machine learning methods when solving problems in various applied areas;

LOC 3 – Possesses the skills of choosing, building, teaching and using the main classifiers when solving problems;

LOC 4 – Possesses the skills of building and checking the quality of machine learning models;

LOC 5 – Owns the interpretation of the results obtained in terms of the applied field in order to obtain new knowledge and conclusions;

Post requisites: IT project management

Component of choice 7

Course: **Fundamentals of Artificial Intelligence**
Intensity of the Course: 5 academic credits
Module Code: **DAET 202/2**
Module Name: Digital analytical educational technologies
Prerequisites: Information and Communication Technologies (in English)
Purpose: study of the theoretical foundations of artificial intelligence and the design of knowledge-based systems, areas of use of intelligent systems, their capabilities and limitations; in-depth study of the theory and practice of methods and means of representation and processing of knowledge in artificial intelligence systems.

Short Description: In this course the main directions of work in the field of artificial intelligence will be introduced. On this course will understand the importance of quality data. Study general methods of data extraction, data cleaning, functional engineering applications and prepare them for preliminary analysis and hypothesis testing.

Learning Outcomes in EP (LOP):

LOP 4 – Uses artificial intelligence approaches, methods of analysis and processing of big data to solve professional problems in the specialty.

LOP 9 – Uses digital literacy and interdisciplinary knowledge in solving professional problems and determines the cause-and-effect relationships of natural scientific processes and phenomena.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the architecture of artificial intelligence systems and is able to explain their principle of operation;

LOC 2 – Knows basic artificial intelligence tools;

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LOC 3 – Able to apply basic information processing algorithms to the solution of applied problems, evaluate the complexity of algorithms, program and test programs;

LOC 4 – Able to apply methods of analysis of the applied area at the conceptual, logical, mathematical and algorithmic levels.

*Post requisites:*IT project management

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3 OPTIONAL COMPONENTS OF THE CYCLE OF MAJOR COURSES

Component of choice 1

Course: **Designing Mobile Applications**
Intensity of the Course: 5 academic credits
Module Code: **DAET 301/1**
Module Name: Digital analytical educational technologies
Prerequisites: Object Oriented Programming
Purpose: studying the basics and gaining practical skills in software engineering in the field of software development for mobile devices; familiarizing students with the basic principles of developing applications for the Android and Windows Phone operating systems and the technology for creating mobile applications using Java and C # using the Android or Windows Phone SDK.
Short Description: This course will introduce you to Android Studio and the fundamental concepts of application development for Android. Become familiar with high-level programming and master the tools needed to develop applications for Android. Learn about operating systems and various platforms for creating mobile applications. In the end will develop an application for Android with the construction of each aspect of the managed project.
Learning Outcomes in EP (LOP):
LOP 3 – Develops computer and mobile applications according to the requirements of modern education using high-level programming languages.
LOP 5 – Designs web applications and educational systems with an ergonomic user interface based on flexible methodology and principles of network security.
Learning Outcomes in Course (LOC):
LOC 1 – Knows the stages and trends in the development of programming, ways of using IT in the development of mobile applications.
LOC 2 – Knows the peculiarities of using service programs and shells when developing mobile applications.
LOC 3 – Knows how to choose the optimal software product and information technology models from several possible ones for solving an applied problem, and conduct a comparative assessment of efficiency.
LOC 4 – Able to develop service programs and service shells when developing mobile applications, taking into account a specific subject area.
Post requisites: Information systems design

Component of choice 1

Course: **Development and Creation of Computer Games**
Intensity of the Course: 5 academic credits
Module Code: **DAET 301/2**
Module Name: Digital analytical educational technologies
Prerequisites: Object Oriented Programming
Purpose: familiarization of students with the complex of modern technologies and concepts sufficient for the professional development of computer games.
Short Description: This course deals with advanced game development environments for PC, mobile devices (Android, iOS) and browsers. Students are introduced to the Unity3D engine and MonoDevelop game scripting environment, learn how to create a 2D scene, program game logic and develop its concept, and self-organize elements, test and debug, finalise the game and add audio support.

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Learning Outcomes in EP (LOP):

LOP 3 – Develops computer and mobile applications according to the requirements of modern education using high-level programming languages.

LOP 5 – Designs web applications and educational systems with an ergonomic user interface based on flexible methodology and principles of network security.

Learning Outcomes in Course (LOC):

LOC 1 – Knows how to describe a game situation, see the possibilities of using computer game technology in solving problems.

LOC 2 – Knows how to select a development environment in accordance with the requirements for a game application (realizable capabilities, genre, technical characteristics, etc.); implement the basic algorithms of a game application.

LOC 3 – Knows how to implement individual stages of a computer game development

LOC 4 – fluent in design and development of software products.

LOC 5 – Owns the principles of construction, structure and methods of working with tools that support the creation of a game application.

Post requisites: Analytical software

Component of choice 2

Course: **Web Analytics**
Intensity of the Course: 6 academic credits
Module Code: **ITES 301/1**
Module Name: Innovative technologies in the educational system
Prerequisites: Information and analytical systems
Purpose: students gaining theoretical and practical knowledge on statistical research on the Internet, collecting and analyzing information about site visitors; conducting marketing research on the Internet, as well as analyzing the performance of web services.

Short Description: This course is aimed at studying web systems in the educational system. In this course students will get acquainted with educational sites (kundelik, bilimlend, darynonline, etc.), will study the structure of educational sites and master the methodology of web-analysis, analysis of site attendance, will analyze usability, scrolling, behavior of visitors on the page. At the end of the course, they will be able to compare with general trends and with competitors using independent platforms.

Learning Outcomes in EP (LOP):

LOP 5 – Designs web applications and educational systems with an ergonomic user interface based on flexible methodology and principles of network security.

LOP 6 – Designs and analyzes software using modern algorithmic and mathematical methods.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the key performance indicators of the site as an information system, the principles of web analytics systems, how to use analytical data in the design of the information system interface design.

LOC 2 – Knows how to use specialized systems to identify the information needs of the site user, use analytics systems to formalize the requirements of the customer's users, interpret analytical data to develop a project for the information system user interface.

LOC 3 – Possesses the skills of interpreting analytical data to formulate requirements for an information system.

LOC 4 – Possesses the skills of analyzing and interpreting information about users of websites.

LOC 5 – Skills in the interpretation of web analytics data to optimize the user interface of the information system.

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Post requisites: Analytical software

Component of choice 2

Course: **Digital Transformation of the Education System**
Intensity of the Course: 6 academic credits
Module Code: **ITES 301/2**
Module Name: Innovative technologies in the educational system
Prerequisites: Information and analytical systems
Purpose: define contexts, basic concepts and goals of digital transformation of the education system
Short Description: The course is aimed at solving the problems of socio-economic development of the country in the context of the fourth industrial revolution and the establishment of the digital economy. The experience of digitalizing education worldwide is being studied.
Learning Outcomes in EP (LOP):
LOP 3 – Develops computer and mobile applications according to the requirements of modern education using high-level programming languages.
LOP 8 – Manages IT projects, computing and information systems in the course of professional activity, applies methods of information data protection.
Learning Outcomes in Course (LOC):
LOC 1 – knows digital technologies used in education.
LOC 2 – possesses knowledge of technical means of digitalization of education.
LOC 3 – possesses the skills of organizing the educational process using digital technology.
LOC 4 – uses digital technology to measure student achievement.
Post requisites: Production Practice.

Component of choice 3

Course: **Design of Information Systems**
Intensity of the Course: 6 academic credits
Module Code: **DAET 304/1**
Module Name: Digital analytical educational technologies
Prerequisites: Client-server Technologies
Purpose: Practical application of information systems design methods, training in practical skills in organizing the collection, processing and management of data and information for conducting the design process of a software project using specialized software packages and systems. Development of elementary practical skills in the use of organizational tools for managing the design process.
Short Description: This course provides the basic concepts of information systems design technology. Teach the processes and models of the life cycle of information systems. They will study organizations designing information systems. At the end of the course, they will learn skills in designing information systems..
Learning Outcomes in EP (LOP):
LOP 4 – Uses artificial intelligence approaches, methods of analysis and processing of big data to solve professional problems in the specialty.
LOP 7 - Develops digital analytical educational systems using modern methods of system and visual programming.
LOP 8– Manages IT projects, computing and information systems in the course of professional activity, applies methods of information data protection.
Learning Outcomes in Course (LOC):

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LOC 1 – Knows the composition and structure of various classes of IS as objects of analysis and design;

LOC 2 – Knows how to analyze the subject area;

LOC 3 – Able to simulate applied and informational processes;

LOC 4 – Possesses the skills of working with tools for modeling the subject area, applied and information processes;

LOC 5 – Skills in using functional and technological IS standards;

LOC 6 – Possesses the skills of working with tools for designing databases and knowledge.

Post requisites: Production Practice

Component of choice 3

Course: **Analytical Software**

Intensity of the Course: 6 academic credits

Module Code: **DAET 304/2**

Module Name: Digital analytical educational technologies

Prerequisites: Client-server Technologies

Purpose: Familiarity with the knowledge discovery methodology in databases and data warehouses. Study of the main methods and approaches to analytical support of management decisions.

Short Description: In this course students will gain knowledge in the application of methods of analytical processing of super-large volumes of information stored in modern data warehouses, improving the skills of practical use of methods of mathematical statistics and machine learning for solving data processing problems, as well as improving the skills of using analytical software, designed for the mining of data, aimed at the formation of a holistic view of the analysis and interpretation of data, both on the search process and the application of hidden patterns in order to achieve the objectives.

Learning Outcomes in EP (LOP):

LOP 5 – Designs web applications and educational systems with an ergonomic user interface based on flexible methodology and principles of network security.

LOP 7 – Develops digital analytical educational systems using modern methods of system and visual programming.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the stages and activities of data mining; subject-oriented analytical systems, methods and means of obtaining and processing information through modern analytical platforms; evolutionary programming systems.

LOC 2 – Knows how to obtain the necessary statistical reports and offers logical action models for making tactical and strategic management decisions;

LOC 3 – Possesses the skills of creating analytical reporting;

LOC 4 – Skills in using analytical software.

Post requisites: no