CATALOG OF ELECTIVE DISCIPLINES

6B06 - Information and Communication Technologies
(Code and classification of the field of education)

6B061 - Information and communication technologies
(Code and classification of the direction of training)

0610
(Code in the International Standard Classification of Education)

B057 - Information technology
(Code and classification of the educational program group)

6B06105 - Computer Engineering and Software/Smart Computing
(Code and name of the educational program)

bachelor
(Level of preparation)

set of 2023

Semey 2023

Developed
By the Academic Committee of the OP
The head of the AK Nurymkhan Gulnur Nesiptaikyzy
OP Manager Kurushbaeva Dinara Talgatovna

Reviewed
At the meeting of the Quality Assurance Commission of the
Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4/6 «10» April 2023
Chairman of the Commission on Quality Assurance Abdilova G.B.

Approved
At the meeting of the Academic Council of the University
Protocol № 5 " 21 " 04 2023 year
Chairman of the Academic Council Oralkanova I. A.

Pre-diploma practice

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline
During the pre-graduate internship, they will get acquainted with the basic standards used in the development and design of a software product, the latest achievements and prospects for the development of information technologies and systems, databases and technology for the development and protection of databases, enterprise software development tools and elements of professional activity necessary to perform a final qualification (diploma) work.

Purpose of studying of the discipline
Preparing the student to complete a diploma project, the ability to rationally use theoretical and practical knowledge acquired while studying at a university, as well as practical study of the forms and methods of organizing production and labor processes adopted at the enterprise from the point of view of their efficiency. Acquire skills in developing, launching, debugging and adjusting programs; the opportunity to acquire the ability to use ready-made software products and provide support for implemented programs and software.

Learning Outcomes
ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc
ON 11 To develop mobile apps with AndroidStudio, to write programs in Java, C++, C#, HTML, CSS, to analyze and to implement securities protection tools for mobile devices and their applications, as well as web applications, to create and to host websites on the Internet, to create domain names and to deploy servers

Learning outcomes by discipline
1) Organizes the collection, systematization and synthesis of materials for the preparation of the final qualifying work and its review part.
2) Creates software for the systems and devices being created within the framework of the topic of the diploma project.
3) Researches new ICT tools, software, hardware and software systems and modernizes existing ones.
4) Demonstrates skills in preparing design and program documentation.

Prerequisites
Internship II

Postrequisites
Final examination

Internship III

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline
The student reinforces the theoretical knowledge gained with practical actions during the period of practical training at the enterprise, and also acquires the necessary skills. The course covers: the issues of applying and interpreting information to develop practical solutions in order to carry out effective production and financial activities of an enterprise (business) in the context of the development of integration processes, considers the experience of applying advanced methods of organization and management in an enterprise.

Purpose of studying of the discipline
Deepening and consolidating theoretical knowledge gained in the learning process, developing skills in working with legislative and instructive materials; studying the practical use of economic management methods, the structure and foundations of organizing the activities of enterprises; mastering the practical skills of the future educational program.

Learning Outcomes
ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc
ON 11 To develop mobile apps with AndroidStudio, to write programs in Java, C++, C#, HTML, CSS, to analyze and to implement securities protection tools for mobile devices and their applications, as well as web applications, to create and to host websites on the Internet, to create domain names and to deploy servers

Learning outcomes by discipline
1) Organizes the collection, systematization and synthesis of materials for the preparation of the final qualifying work and its review part.
2) Creates software for the systems and devices being created within the framework of the topic of the diploma project.
3) Researches new ICT tools, software, hardware and software systems and modernizes existing ones.
4) Demonstrates skills in preparing design and program documentation.

Prerequisites
Internship II

Postrequisites
Final examination

Software Architecture

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course "Software Architecture" is designed to familiarize students with the general principles of software design and specific embodiments of these principles in programming. The discipline teaches you to reasonably choose the means to achieve the required level of program performance, as well as instills skills that are associated with the operation and maintenance of equipment and equipment containing modern software development tools.

Purpose of studying of the discipline

The purpose of the discipline is to study the modern fundamentals of programming technology for computing processes and other various applied tasks, to develop students' skills in using modern tools.

Learning Outcomes

ON 5 To use various support programs, best practices and functions that are necessary for professional development

Learning outcomes by discipline

1. Briefly outline methods and technologies in modern programming
2. Create software blocks to solve assigned tasks
3. Demonstrate programming skills using modern techniques.
4. Demonstrate knowledge of the rules for setting and solving practical problems.

Prerequisites

Fundamentals of algorithmization

Postrequisites

Object-Oriented Programming with Java

Software Design

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course "Software Design" forms special knowledge, mathematical and practical skills in the field of programming and solving various problems, introduces students to the issues of designing software systems and ensuring the life cycle of programs. The discipline is designed to familiarize students with the general principles of software design and the specific implementation of these principles when programming on various platforms.

Purpose of studying of the discipline

The purpose of the discipline is to develop in the student solid knowledge in the field of program design, practical skills sufficient for successful production activities and allowing him to independently master new necessary knowledge and achievements in the field of programming and problem solving.

Learning Outcomes

ON 5 To use various support programs, best practices and functions that are necessary for professional development
ON 7 To know programming languages, such as C # and C ++, to work in the development of various programs and video games

Learning outcomes by discipline

1. Briefly outline methods and technologies in modern programming
2. Create software blocks to solve assigned tasks
3. Demonstrate programming skills using modern techniques.
4. Demonstrate knowledge of the rules for setting and solving practical problems.

Prerequisites

Fundamentals of algorithmization

Postrequisites

Object-Oriented Programming with Java

Programming Technologies

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline "Programming Technologies" is devoted to the study of the principles of design and development of software systems and techniques for ensuring the manufacturability of software. This course examines the most common techniques and methods used in programming processes, as well as the problems that often arise in them. The capabilities of modern programming languages are determined by the capabilities of the programming environment in which this language is presented.

Purpose of studying of the discipline

The purpose of the discipline is to study the modern fundamentals of programming technology for computing processes and other various applied tasks, to develop students' skills in using modern tools.

Learning Outcomes

ON 5 To use various support programs, best practices and functions that are necessary for professional development

Learning outcomes by discipline

1. Briefly outline methods and technologies in modern programming
2. Create software blocks to solve assigned tasks
3. Demonstrate programming skills using modern techniques.
4. Demonstrate knowledge of the rules for setting and solving practical problems.

Prerequisites

Fundamentals of algorithmization

Postrequisites

Object-Oriented Programming with Java

Operating system concepts and network management

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course provides students with information about the functions of operating systems and computer networks, system interfaces, process control, concurrency, low and high level IPC, deadlock detection and recovery, and memory management. The course describes communication models, local and global networks, client-server system; covered the issues of network management, reliability of data transmission, flow control, congestion control, IP addressing, Internet routing algorithms

Purpose of studying of the discipline

The purpose of the course is to learn the importance of the operating system and its functions. Various methods used by the operating system to achieve its goals as resource management.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Forms the basic approaches to the design and organization of modern operating systems.
2) Demonstrates the skills to work and develop applications in any modern OS.
3) Explains the question of the capabilities and scope of modern operating systems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Linux Operating Systems & Networking

Operating Systems

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

Understanding and optimizing operating system performance is an important requirement for computer science students. Software developers, system support administrators, network and database administrators all require a good understanding of operating system concepts in order to work efficiently and economically. Students will gain an understanding of the factors to consider when selecting, deploying, configuring, optimizing, and securing an operating system.

Purpose of studying of the discipline

The purpose of the discipline is to teach students to use modern operating systems to ensure efficient and safe operation of users of enterprise information systems, to give them the theoretical knowledge and skills necessary to master new operating systems and apply them throughout the enterprise.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Forms the basic approaches to the design and organization of modern operating systems.
2) Demonstrates the skills to work and develop applications in any modern OS.
3) Explains the question of the capabilities and scope of modern operating systems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Linux Operating Systems & Networking

System software

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

A computer system is made up of hardware and software that work together to perform useful work. In this course, students will learn how to program a real computer system by learning the abstractions, interfaces, and design decisions that affect how that software works. The course will give students a solid understanding of the software used in a computer hardware system running an operating system.

Purpose of studying of the discipline

The discipline "System Software" aims to acquire students fundamental knowledge about the basic theoretical and practical aspects of system programming at the level of program development, which makes it possible to obtain modern programs with a complex logical structure at the lowest cost.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the

organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Forms the basic approaches to the design and organization of modern operating systems.
2) Demonstrates skills to work and develop applications in any modern OS.
3) Explains the question of the capabilities and scope of modern operating systems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Linux Operating Systems & Networking

Computer Architecture and Digital Systems

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course introduces students to computer architecture and the design of efficient computing and memory systems. Key topics in this course include: hardware-software interface (instruction set, data-level and thread-level parallelism), assembly language programming, performance measures (performance, power, power consumption, and cost), processor design (pipelining and vectors), memory hierarchy . (cache, RAM), virtualization, basic I/O and custom accelerator design.

Purpose of studying of the discipline

This course is designed to introduce students to the basics of digital logic and then gradually introduce them to the basics of modern computer architecture.

Learning Outcomes

ON 5 To use various support programs, best practices and functions that are necessary for professional development

Learning outcomes by discipline

1) Demonstrates the architecture of the main types of modern computers.
2) Uses methods of information exchange in systems.
3) Applies the acquired knowledge in his professional activities.

Prerequisites

School course

Postrequisites

Operating Systems System software Operating system concepts and network management Network Infrastructure and Management Computer communication and networking Network Administration and Design

Computer Organization and Assembly language

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The foundations of computer structure are covered in this course, with an emphasis on the low - level abstractions of a computer, such as digital logic, the instruction set, and programming in assembly language. Data representation, digital logic, logical expression simplification, simple combinational circuit design and analysis, simple synchronous serial network design and analysis, read- only memory and random access memory, and assembly language programming are among the topics covered.

Purpose of studying of the discipline

Provide the basics of computer organization with emphasis on low- level abstractions of a computer system, including digital logic, instruction set, and assembly language programming.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Applies the basic operating principles of an IBM PC-compatible computer.
2) Explores the strategy and criteria for process dispatch.
3) Uses professional skills in working with information and computer technologies in scientific and educational activities, as well as in the social sphere.

Prerequisites

School course

Postrequisites

Operating Systems System software Operating system concepts and network management Network Infrastructure and Management Computer communication and networking Network Administration and Design

Digital logic fundamentals

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course provides an introductory understanding of the analysis and design of digital logic, which is the basis for the development of computer hardware. The course consists of three main sections. The first topic deals with the number representations used in modern digital systems and discusses their arithmetic properties and conversion methods. The second section is devoted to the combination theory of switching. The third section deals with the analysis and design of synchronized serial circuits.
Purpose of studying of the discipline
The purpose of the discipline is to master logical knowledge and skills in the classical branches of logic, necessary in everyday life, for the study of related natural science disciplines at a basic level and disciplines of the professional cycle.
Learning Outcomes
ON 6 To use the basic laws of natural sciences in professional activities, methods of mathematical analysis and modeling, theoretical and experimental research
Learning outcomes by discipline
1) Demonstrates knowledge of the arithmetic and logical fundamentals of computers.
2) Applies methods for the synthesis of combinational circuits and digital automata.
3) Identifies the capabilities of technical means, theoretical and practical foundations of the structural and architectural construction of specific types of computers and systems.
Prerequisites
School course
Postrequisites
Operating Systems System software Operating system concepts and network management Network Infrastructure and Management Computer communication and networking Network Administration and Design

Introduction to Information Technology

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The use of advanced technologies for organizing, storing, exchanging and processing information is called information technology. The course is intended for people who are just starting to work in the information technology environment. This course introduces students to the fundamentals of communications and information technology, including hardware, operating systems, memory, input/output, data display, databases, data processing systems, the Internet, graphics, and computer security.
Purpose of studying of the discipline
Introduction to IT provides a working glossary of terms used by computer personnel and an introduction to the latest version of Microsoft Office, an integrated software package that includes applications for database management, presentation graphics, spreadsheets, and word processing.
Learning Outcomes
ON 5 To use various support programs, best practices and functions that are necessary for professional development
Learning outcomes by discipline
1) Demonstrates knowledge of the processes and methods of obtaining and processing information in modern society.
2) Briefly outlines the basic concepts, methods, techniques and means of computer information processing.
3) Demonstrates competence in the field of application of information technology in solving professional problems.
Prerequisites
School course
Postrequisites
Cryptography and Cyber Security Introduction to cyber criminology Network security and cryptography

Computer & Information Security

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course will provide students with an understanding of the various security threats in the computing environment and how to deal with them. Course topics also include an overview of the entire information security industry, detailed information on many related topics. This course describes the terminology in the field, the history of the industry, and the strategy for managing computer and information security programs.
Purpose of studying of the discipline
The purpose of the course is to introduce the basic concepts of computer security, learning the principles and practices of computer system security, including operating system security, network security, software security, and web security.
Learning Outcomes
ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies
Learning outcomes by discipline
1) Investigates threats to information security, performs the main stages of solving information security problems.
2) Applies in practice the basic general methodological principles of the theory of information security.
3) Demonstrates operational management of the activities of organizations to comprehensively ensure information security of specific automated systems based on developed programs.
Prerequisites
School course

Postrequisites
Cryptography and Cyber Security Introduction to cyber criminology Network security and cryptography

Fundamentals of information security

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The main goals of information security are to ensure the availability, integrity, accuracy and confidentiality of data. The course covers the basics of vocabulary and terminology used in the field of information security. Methods for identifying system vulnerabilities and their corresponding countermeasures, instructions for ensuring the security of equipment, data and software, including physical security, backup procedure, firewall, encryption and virus protection methods are considered.
Purpose of studying of the discipline
The purpose of the course is to introduce basic security concepts, computer and information security is a comprehensive study of the principles and practices of computer system security, including operating system security, network security, software security and web security.
Learning Outcomes
ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies
Learning outcomes by discipline
1) Investigates threats to information security, performs the main stages of solving information security problems.
2) Applies in practice the basic general methodological principles of the theory of information security.
3) Demonstrates operational management of the activities of organizations to comprehensively ensure information security of specific automated systems based on developed programs.
Prerequisites
School course
Postrequisites
Network Infrastructure and Management Cryptography and Cyber Security Introduction to cyber criminology

RDBMS concepts and Oracle

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
During the course, students will get acquainted with the concept of "database", types of databases, study in detail the relational data model, the stages of designing relational databases. At the user level, they master the Oracle Database 11g database management system. The course provides for quality control of the acquired knowledge in the form of express control and unit tests. Lectures will include practical group sessions on mastering the principles of building a relational data model.
Purpose of studying of the discipline
Learn the basics of data modeling using Oracle.
Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients
Learning outcomes by discipline
1) Briefly outlines modern methods and tools for developing and synthesizing data models for subject areas and automated information processing and management systems.
2) Explores modern means of implementing data integrity.
3) Applies methods for organizing databases in various architectures.
4) Uses modern database application design methodology.
Prerequisites
Network Infrastructure and Management Computer communication and networking Network Administration and Design
Postrequisites
Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Distributed and centralized database

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course covers the principles of distributed databases and how they differ from centralized databases. The focus is on understanding the concepts of designing and managing distributed databases. In addition, the course introduces the problems of distributed data management, especially in the case of heterogeneous databases. The course will cover the most widely used systems and methods in the field of data integration for distributed environments.
Purpose of studying of the discipline
The main objective of the course is to enable students to develop basic knowledge of DBMS and RDBMS in distributed database and

centralized database systems. This course becomes the foundation for cloud computing.

Learning Outcomes

ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline

1) Briefly outlines modern methods and tools for developing and synthesizing data models for subject areas and automated information processing and management systems.
2) Explores modern means of implementing data integrity.
3) Applies methods for organizing databases in various architectures.
4) Uses modern database application design methodology.

Prerequisites

Network Infrastructure and Management Computer communication and networking Network Administration and Design

Postrequisites

Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Database Management Systems

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course will teach students the specific methods and practices needed to design and implement database systems. Database Management Systems Course is currently the dominant system for marketing, scientific, and engineering applications. This course covers the data structure model, standardization, the relational model, relational algebra, data access queries, and SQL fundamentals.

Purpose of studying of the discipline

The goal of the discipline is to develop students` understanding of the structure and functions of database management systems, the features of working with databases on the network, the design of client- server applications that interact with relational databases controlled by modern DBMSs, and their application in various fields of activity.

Learning Outcomes

ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline

1) Briefly outlines modern methods and tools for developing and synthesizing data models for subject areas and automated information processing and management systems.
2) Explores modern means of implementing data integrity.
3) Applies methods for organizing databases in various architectures.
4) Uses modern database application design methodology.

Prerequisites

Network Infrastructure and Management Computer communication and networking Network Administration and Design

Postrequisites

Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Introduction to cyber criminology

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course traces the history, definitions and typologies of computer networks and cybercrime. The course introduces students to the different types of cybercrime and their impact on their victims, whether they are individuals, institutions or communities. Particular attention in this course is given to digital devices connected to the network, as well as how to recognize and protect yourself from online crime activities through practical actions.

Purpose of studying of the discipline

The purpose of the course is to introduce criminology. Cyber criminology is one of the newest areas of interdisciplinary research in criminal law, which combines the achievements of criminal justice and computer science to study the problems of computer crime.

Learning Outcomes

ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline

1) Briefly outlines methods of protecting information from unauthorized access and special influences on it, typical software and hardware-software tools for protecting information.
2) Applies cryptographic means to protect confidential information.
3) identify threats to information security.
4) Applies information security measures in operating systems, including anti-virus protection tools.
5) Explores the processes of functioning of software and hardware and software for information security.

Prerequisites

Computer & Information Security Introduction to Information Technology Fundamentals of information security

Postrequisites

Digital Forensics and Investigations Basics of Cyber Forensic Fraud and countermeasures in IT and telecommunications

Cryptography and Cyber Security

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course focuses on the basics of modern cryptographic protocols and their applications for e- voting, digital currency, sensor networks, IoT, IoV, smart home, etc. The course introduces symmetric and asymmetric cryptographic systems and the most important parts of cryptology, including many cryptographic methods and algorithms . Particular attention is paid to the practical application of these methods and algorithms.

Purpose of studying of the discipline

The purpose of this course is to introduce students to the fields of cryptography and cryptanalysis. To develop a basic understanding of the algorithms used to protect users online and to understand some of the design choices behind these algorithms.

Learning Outcomes

ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline

1) Briefly outlines methods of protecting information from unauthorized access and special influences on it, typical software and hardware-software tools for protecting information.
2) Applies cryptographic means to protect confidential information.
3) identify threats to information security.
4) Applies information security measures in operating systems, including anti-virus protection tools.
5) Explores the processes of functioning of software and hardware and software for information security.

Prerequisites

Computer & Information Security Introduction to Information Technology Fundamentals of information security

Postrequisites

Digital Forensics and Investigations Basics of Cyber Forensic Fraud and countermeasures in IT and telecommunications

Network security and cryptography

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course focuses on the principles and methods of encryption and network security. Classical systems, symmetric block cryptography (DES, AES and other modern symmetric cryptography), linear and differential cryptographic analysis, complete secrecy, public- key cryptographic algorithms for factorization and discrete logarithm, encryption protocols, hashing capabilities, cryptography, key management, key exchange , signature scheme, messenger and network security, viruses, firewalls, digital rights and other topics.

Purpose of studying of the discipline

This course introduces students to the principles and practices of cryptography and network security, exploring popular cryptographic techniques and security protocols and their applications to counter network threats and security attacks.

Learning Outcomes

ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline

1) Briefly outlines methods of protecting information from unauthorized access and special influences on it, typical software and hardware-software tools for protecting information.
2) Applies cryptographic means to protect confidential information.
3) identify threats to information security.
4) Applies information security measures in operating systems, including anti-virus protection tools.
5) Explores the processes of functioning of software and hardware and software for information security.

Prerequisites

Computer & Information Security Introduction to Information Technology Fundamentals of information security

Postrequisites

Digital Forensics and Investigations Basics of Cyber Forensic Fraud and countermeasures in IT and telecommunications

Computer communication and networking

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

Users surf the web, check email, make VoIP phone calls, and participate in video conferences through computers. All of these applications are made possible by networking computers. This course is designed to give students a solid understanding of how networks are built and how they allow computers to be used to exchange information and communicate with each other.

Purpose of studying of the discipline

The purpose of this course is to provide basic knowledge in the field of computer networks and digital communications with emphasis

on Internet protocols, OSI models, security, multimedia, IPv4/6, wireless networks, etc.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Briefly outlines concepts in the field of computer networks.
2) Briefly outlines standard design standards and regulatory and technical documentation in the field of building computer networks.
3) Uses standard software products aimed at solving design and technological problems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Database Management Systems Distributed and centralized database RDBMS concepts and Oracle Web Applications Development

Network Infrastructure and Management

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course presents the concept and technologies used in computer network management. Students create, report, and implement the complex network environment, including protection, as well as configure network management systems to monitor and trouble shooting networking devices and configure and use software to maintain and trouble shooting remote computer systems from a central operations center.

Purpose of studying of the discipline

The course introduces networking and digital communications with emphasis on Internet Protocol, Application Layer Architecture, HTTP, SMTP, etc. To enable students to understand security, multimedia protocols, quality of service, mobility, wireless network management.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Briefly outlines concepts in the field of computer networks.
2) Briefly outlines standard design standards and regulatory and technical documentation in the field of building computer networks.
3) Uses standard software products aimed at solving design and technological problems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Database Management Systems Distributed and centralized database RDBMS concepts and Oracle Web Applications Development

Network Administration and Design

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course focuses on the design, installation, configuration and operation of local networks. The course provides students with the skills and knowledge necessary to configure and install standalone and client computers that are part of a workgroup or domain. We will also discuss alternative LAN methodologies, including Novell NetWare, UNIX, Microsoft Windows 2000, Windows 98, and Windows NT.

Purpose of studying of the discipline

The course introduces networks and digital communications with an emphasis on Internet protocol. It is important to maintain strong and well-maintained network services since all businesses depend on networks.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Briefly outlines concepts in the field of computer networks.
2) Briefly outlines standard design standards and regulatory and technical documentation in the field of building computer networks.
3) Uses standard software products aimed at solving design and technological problems.

Prerequisites

Computer Architecture and Digital Systems Digital logic fundamentals Computer Organization and Assembly language

Postrequisites

Database Management Systems Distributed and centralized database RDBMS concepts and Oracle Web Applications Development

Artificial Neural Networks

Discipline cycle	Profiling discipline
Course	3
Credits count	5

Knowledge control form	Examination

Short description of discipline
Given a specific goal, some training set, and enough computing power, artificial neural networks can write themselves. The course provides an overview of artificial neural networks ("Deep Learning"). Course topics will cover models for various applications, how to train and test them, and how to implement them in real-life applications, with an emphasis on both theory and practice.

Purpose of studying of the discipline
The course aims to provide a strong fundamental understanding that is often applied to a variety of complex real-world problems and applications and scenarios such as web search, speech recognition, facial recognition, machine translation, autonomous driving and automatic planning.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Uses programming languages to implement tasks.
2) Uses the language of first-order predicates to formalize and implement tasks.
3) Demonstrates knowledge of the basics of mathematical logic.
4) Explores the selected subject area, searches in the state space.

Prerequisites
Database Management Systems Distributed and centralized database RDBMS concepts and Oracle

Postrequisites
Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Artificial Intelligence

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
Artificial intelligence is a research field that studies how to implement intelligent human behavior on computer systems. The ultimate goal of developing artificial intelligence is to create a universal computer capable of autonomous learning, planning its activities and effectively solving problems. Course topics include: problem solving, reasoning chain building, planning and understanding human speech, self-programming, computer vision system, deep learning.

Purpose of studying of the discipline
The course aims to provide a strong fundamental understanding that is often applied to a variety of complex real-world problems and applications and scenarios such as web search, speech recognition, facial recognition, machine translation, autonomous driving and automatic planning.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Uses programming languages to implement tasks.
2) Uses the language of first-order predicates to formalize and implement tasks.
3) Demonstrates knowledge of the basics of mathematical logic.
4) Explores the selected subject area, searches in the state space.

Prerequisites
Operating system concepts and network management Database Management Systems Distributed and centralized database

Postrequisites
Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Artificial intelligence and expert systems

Discipline cycle	Profiling discipline
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course provides an introduction to the field of artificial intelligence and expert systems. This course will explore a range of theories, mathematical formalisms, and algorithms that cover some of the core elements of computational intelligence. The course will cover the following main topics: search, logical representations and reasoning, automated planning, representation and reasoning under uncertain conditions, decision making under uncertain conditions, and learning.

Purpose of studying of the discipline
The course aims to provide a strong fundamental understanding that is often applied to a variety of complex real-world problems and applications and scenarios such as web search, speech recognition, facial recognition, machine translation, autonomous driving and automatic planning.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline

1) Uses programming languages to implement tasks.
2) Uses the language of first-order predicates to formalize and implement tasks.
3) Demonstrates knowledge of the basics of mathematical logic.
4) Explores the selected subject area, searches in the state space.

Prerequisites

Operating system concepts and network management Database Management Systems Distributed and centralized database

Postrequisites

Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Wireless Networks and Ubiquitous Computing

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course will provide students with an understanding of the interdisciplinary field of research based on signal processing, deep machine learning, device manufacturing, psychological and sociological aspects of human-computer interaction. The course covers important issues related to data collection and processing, model representation, and estimation. Promising ideas for future research that may address some of these questions are discussed.

Purpose of studying of the discipline

The purpose of the discipline is to study the fundamentals and practical application of computing systems, networks and telecommunications for the construction and operation of broadband networks and application systems based on them.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Uses methods for constructing and using wireless networks to create local and mobile Wi-Fi networks.
2) Demonstrates knowledge of systems and network design theory.
3) Explores the principles of organization and functioning of networks and telecommunications.

Prerequisites

Network Administration and Design

Postrequisites

Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Microwave communication

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The fundamentals of microwave circuit design and analysis, from the principles of electromagnetic theory to the design of radar systems, are covered in this course. Emphasis is placed on the design of a wireless communication system and high data transfer rates. An overview of electromagnetic theory is given at the start of the course, and students are then guided through the design of passive and active microwave circuits using sophisticated software for high frequency system.

Purpose of studying of the discipline

The goal is to classify the wave solutions of Maxwell`s equations into groups and consider which wave solutions are relevant for transmission lines and hollow waveguides. Explain and describe power lines both from a field perspective and using a circuit model.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Uses methods for constructing and using wireless networks to create local and mobile Wi-Fi networks.
2) Demonstrates knowledge of systems and network design theory.
3) Explores the principles of organization and functioning of networks and telecommunications.
4) Applies wireless communications system design skills.

Prerequisites

Network Infrastructure and Management Computer communication and networking Network Administration and Design

Postrequisites

Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Mobile communication system

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course describes the basic principles of operation of cellular communication systems. System architectures are discussed in

general, and examples from some of the most important UMTS and GSM systems are discussed in the course. It also discusses how radio wave propagation in a mobile radio channel affects and limits the performance of digital communication systems. A description of various methods of resource sharing in mobile communication and methods for calculating the throughput of systems is given.

Purpose of studying of the discipline

The course introduces the architecture and operating principles of mobile communications systems, which include cellular concepts, mobile communications standards, mobile IP networks, diversity schemes, etc.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Uses methods for constructing and using wireless networks to create local and mobile Wi-Fi networks.
2) Applies the basic elements of the user interface of mobile applications.
3) Uses the capabilities of interaction with geolocation and mapping services.
4) Applies wireless communications system design skills.

Prerequisites

Network Infrastructure and Management

Postrequisites

Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Fundamentals of game design

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

Goals, gameplay, actions, fundamental mechanics, game worlds, characters, storytelling, game balance, user interfaces, and level design are some of the key topics covered in the course. Using the best practices of iteration and play testing, students will create new prototypes and games. The formal components of games, mechanics and dynamics, decision making, flow states and player psychology, iterative process and rapid prototyping are covered in the course.

Purpose of studying of the discipline

The purpose of this course is to enable students to improve their programming skills for game development. This is a basic course in game design, graphical interfaces, and computer game development.

Learning Outcomes

ON 7 To know programming languages, such as C # and C ++, to work in the development of various programs and video games

Learning outcomes by discipline

1) Applies research techniques and skills to maintain an understanding of the latest industry recommendations;
2) Identifies the results of one's own activities in comparison with the expectations and needs of the client and the organization;
3) Demonstrates the ability to design an application using application layout, diagrams, and transitions.
4) Describes the settings of game objects and their components.
5) Identifies features of optimization of computer games and applications for PCs and mobile devices.

Prerequisites

2D Computer Animation

Postrequisites

Virtual Reality

Computer Games Programming & Game Engine

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course will focus on using programming to further enhance the gameplay, such as using C++ to control the elements of a computer game. It also covers game development, gaming careers - the skills and knowledge that students will need to work in the games industry, as well as the latest developments in the games industry, including current research. Students will gain a wide range of knowledge and skills, including mobile and web application development

Purpose of studying of the discipline

The purpose of this course is to enable students to improve their programming skills for game development. Develop knowledge and interest in computer game development and a gaming career to work in the gaming industry.

Learning Outcomes

ON 7 To know programming languages, such as C # and C ++, to work in the development of various programs and video games

Learning outcomes by discipline

1) Applies research techniques and skills to maintain an understanding of the latest industry recommendations;
2) Identifies the results of one's own activities in comparison with the expectations and needs of the client and the organization;
3) Demonstrates the ability to design an application using application layout, diagrams, and transitions.
4) Describes the settings of game objects and their components.
5) Reveals features of optimization of computer games and applications for PC and
mobile devices.

Prerequisites

2D Computer Animation

Postrequisites
Virtual Reality

Game development for mobile platforms

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course covers the development of software for mobile platforms such as tablets and smartphones, with a focus on game development. The course includes the development of interactive applications and the use of a wide range of network functions and sensors, as well as the basic elements of graphics and animation programming. The course also covers the mechanics of software distribution for mobile computing platforms. The operating systems iOS and Android will be considered.

Purpose of studying of the discipline
This course focuses on software applications for mobile platforms such as smartphones and tablets, with an emphasis on games. The focus is on Android programming to help students develop games for mobile phones.

Learning Outcomes
ON 7 To know programming languages, such as C # and C ++, to work in the development of various programs and video games

Learning outcomes by discipline
1) Applies research techniques and skills to maintain an understanding of the latest industry recommendations;
2) Identifies the results of one's own activities in comparison with the expectations and needs of the client and the organization;
3) Demonstrates the ability to design an application using application layout, diagrams, and transitions.
4) Describes the settings of game objects and their components.
5) Reveals features of optimization of computer games and applications for PC and mobile devices.

Prerequisites
2D Computer Animation

Postrequisites
Virtual Reality

Fraud and countermeasures in IT and telecommunications

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course introduces the theory and practice of fraud detection across a range of problem areas, including money laundering, credit card fraud, telecommunications fraud, and computer and network intrusion. Definition of fraud in various contexts, relationship between fraud prevention and detection, data management and collection, statistical tests and statistical power, and methods for statistical fraud detection

Purpose of studying of the discipline
This course is designed to introduce students to fraud and crime in the information technology and telecommunications industries. Also helps students understand the various methods of fraudulent activities carried out in the IT industries.

Learning Outcomes
ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline
1) Demonstrates knowledge of the operating principles of modern information and communication technologies, uses them in the field to solve professional problems, taking into account information security requirements.
2) Demonstrates knowledge of modern technologies used in the field of cybersecurity.
3) Applies methods of analysis in the field of cybersecurity.
4) Researches and analyzes the components of information security systems.

Prerequisites
Cryptography and Cyber Security Introduction to cyber criminology Network security and cryptography

Postrequisites
Ethical Hacking

Basics of Cyber Forensic

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course introduces the principles and practices of cyber forensics, including cyber forensics, data and file recovery techniques, and digital forensic analysis and invalidation. Topics include data collection, digital forensics tools, virtual machines, networking, mobile devices, and cloud forensics. The course includes the following topics: legal and ethical implications of cyber forensics; forensic duplication and data recovery; steganography; as well as tools and methods for investigating cyber intrusions.

Purpose of studying of the discipline
The purpose of this course is to introduce computer forensics, both its fundamentals and incident response best practices. Students will

understand the legal aspects of computer forensics as well as its relationship to the IT field.

Learning Outcomes

ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline

1) Demonstrates knowledge of the operating principles of modern information and communication technologies, uses them in the field to solve professional problems, taking into account information security requirements.
2) Demonstrates knowledge of modern technologies used in the field of cybersecurity.
3) Applies methods of analysis in the field of cybersecurity.
4) Researches and analyzes the components of information security systems.

Prerequisites

Cryptography and Cyber Security Introduction to cyber criminology Network security and cryptography

Postrequisites

Ethical Hacking

Digital Forensics and Investigations

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course will introduce students to computer forensics, its fundamentals and advanced incident response techniques. Students will learn to understand the legal aspects of computer forensics as well as its relation to the field of information technology. Students will master the tools and techniques used to conduct a complete computer forensic investigation. The course will cover the application of the principles and practices of forensic science to the collection, preservation, examination, analysis and presentation of digital evidence.

Purpose of studying of the discipline

The purpose of the course is to introduce computer forensics and incident response best practices. Students also gain knowledge in understanding the legal aspects of computer forensics as it relates to information technology.

Learning Outcomes

ON 9 To identify intrusions using cybersecurity standards, to create and to maintain organizational security policies, to analyze malware and spyware; to apply critical and analytical thinking to the investigation of security anomalies

Learning outcomes by discipline

1) Demonstrates knowledge of the operating principles of modern information and communication technologies, uses them in the field to solve professional problems, taking into account information security requirements.
2) Demonstrates knowledge of modern technologies used in the field of cybersecurity.
3) Applies methods of analysis in the field of cybersecurity.
4) Researches and analyzes the components of information security systems.

Prerequisites

Cryptography and Cyber Security Introduction to cyber criminology Network security and cryptography

Postrequisites

Ethical Hacking

Introduction to Data Warehousing Fundamentals

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course introduces the concepts of database technology used in business intelligence. This includes multidimensional databases and data warehouses, as well as ETL (extract, transform and load) processes and basic dashboard concepts. The necessary methods for designing, implementing, operating and maintaining data warehouses will be presented, with a focus on spatiotemporal data. Particular attention is paid to the problems associated with the integration of heterogeneous data and data quality.

Purpose of studying of the discipline

Teach basic concepts, principles and techniques of data storage.

Learning Outcomes

ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline

1) Lists approaches to storing, presenting and processing information in modern information systems.
2) Correlates the possibilities of information analysis based on Data Mining methods.
3) Plans to build a model for exploratory data analysis.
4) Describes the criteria for selecting analytical platforms.

Prerequisites

Decision Support Systems Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Postrequisites

Cloud Computing and Virtualization Introduction to Cloud Architecture Cloud Storage Infrastructure

Data Mining Concepts and Techniques

Discipline cycle	Profiling discipline

Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The study of algorithms and mathematical modeling that allow computers to identify patterns in database systems, make a prediction, and enhance their performance by communicating with data is known as data mining. Machine learning methods will be given special attention in the course because they provide specific tools for knowledge extraction. Data storage and online analytical processing (OLAP) are two important related technologies that will be discussed.

Purpose of studying of the discipline
The goals of mastering the discipline are for students to master models and methods of data mining and machine learning in problems of information retrieval, data processing and analysis, as well as acquiring the skills of a data scientist and developer of mathematical models, methods and algorithms for data analysis.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Lists approaches to storing, presenting and processing information in modern information systems.
2) Correlates the possibilities of information analysis based on Data Mining methods.
3) Plans to build a model for exploratory data analysis.
4) Describes the criteria for selecting analytical platforms.

Prerequisites
Decision Support Systems Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Postrequisites
Cloud Computing and Virtualization Introduction to Cloud Architecture Cloud Storage Infrastructure

Data Science

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course will provide an overview of applications, market trends, and lessons learned using major platforms such as Hadoop, Spark, and more. The course will introduce students to several data storage methods, including HDFS, HBase, Document Database, and Graph Database. The course will continue to introduce different ways of working with analytical algorithms on different platforms.

Purpose of studying of the discipline
The goal of mastering the discipline is to develop students` skills in developing mathematical models of protected processes and means of protecting information and systems that ensure the information security of objects.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Demonstrates experience in solving a simulated problem in a professional field based on data science methods.
2) Applies data models appropriate to the case.
3) Uses knowledge of data science fundamentals.

Prerequisites
Decision Support Systems Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Postrequisites
Cloud Computing and Virtualization Introduction to Cloud Architecture Cloud Storage Infrastructure

Internet Application and Multimedia

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
In this course, students will gain an understanding of the basic concepts and principles of developing Internet applications and Internet programming, practical knowledge of the basics of developing Internet applications and Internet programming and the basics of website design in various design technologies, will learn the basics of programming Internet applications of various software tools. The course focuses more on the technical aspects than the artistic side of video and multimedia. The basics of composition, camerawork, and editing techniques are included.

Purpose of studying of the discipline
The purpose of this course is to provide students with a comprehensive overview of web application development. To develop students` skills in designing and developing distributed web applications using development tools and technologies such as java script, html5, CSS, etc.

Learning Outcomes
ON 11 To develop mobile apps with AndroidStudio, to write programs in Java, C++, C#, HTML, CSS, to analyze and to implement securities protection tools for mobile devices and their applications, as well as web applications, to create and to host websites on the

Internet, to create domain names and to deploy servers

Learning outcomes by discipline

1) Demonstrates skills and abilities in the development of multimedia network information resources
2) Applies methods for managing a media library of digital information.
3) Lists the purpose, types and functionality of programs for publishing multimedia content.
4) Describes the main types of threats to information security on the network and means of protecting information.

Prerequisites

Wireless Networks and Ubiquitous Computing Microwave communication Mobile communication system

Postrequisites

Internet of Things IoT cloud infrastructure Performance and security in IoT

Mobile Computing

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course introduces concepts, methods, and technologies related to user interfaces for mobile computers. Students should be able to evaluate, create, and explore mobile computing artifacts at a level that enables them to independently contribute to commercial and academic projects. Topics range from more "traditional" looks focused on smartphones and tablets to emerging technologies such as virtual reality, augmented reality and personal robotics.

Purpose of studying of the discipline

The goal of the discipline is to develop skills in the design and development of mobile applications and embedded systems for various purposes, mastering modern programming technologies and analyzing the applicability of such technologies in a specific subject area.

Learning Outcomes

ON 11 To develop mobile apps with AndroidStudio, to write programs in Java, C++, C#, HTML, CSS, to analyze and to implement securities protection tools for mobile devices and their applications, as well as web applications, to create and to host websites on the Internet, to create domain names and to deploy servers

Learning outcomes by discipline

1) Applies algorithms and programming languages, converts information into mobile application software codes.
2) Creates software for mobile and tablet applications.
3) Demonstrates skills in working in local and global information networks.
4) Uses the capabilities of operating systems to create mobile application software

Prerequisites

Wireless Networks and Ubiquitous Computing Microwave communication Mobile communication system

Postrequisites

Internet of Things IoT cloud infrastructure Performance and security in IoT

Advanced Web Technolology

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course introduces modern client - side and server web technologies` concepts, principles, and methods. This course requires knowledge of basic web technologies like as HTML, HTTP, CSS, XML, JavaScript, and others. This course focuses on advanced concepts in web based technologies. These include web standards extensions, a mix of internet technology, web toolkits and development environments, existing server-side web frameworks, and front-end web frameworks.

Purpose of studying of the discipline

The goal of this course is to teach students the concepts, technologies, and techniques for building a large-scale distributed software system using service-oriented computing.

Learning Outcomes

ON 11 To develop mobile apps with AndroidStudio, to write programs in Java, C++, C#, HTML, CSS, to analyze and to implement securities protection tools for mobile devices and their applications, as well as web applications, to create and to host websites on the Internet, to create domain names and to deploy servers

Learning outcomes by discipline

1) Lists tasks for searching for information.
2) Plans the search process.
3) Transforms the information received.
4) Uses information processing tools.
5) Determines the composition of equipment and software for developing an information system.
6) Demonstrates techniques for deploying web services and servers.
7) Lists modern methods for testing the ergonomics of user interfaces.

Prerequisites

Wireless Networks and Ubiquitous Computing Microwave communication Mobile communication system

Postrequisites

Internet of Things IoT cloud infrastructure Performance and security in IoT

Introduction to Cloud Architecture

Discipline cycle	Basic disciplines

Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The course will run from an introductory level, covering topics such as concepts, terminology, technologies, benefits and challenges of cloud computing technology, as well as IaaS, SaaS and PaaS delivery models and general cloud deployment models, characteristics of the cloud, to an advanced level, covering such topics. how to develop complex cloud solutions, including hybrid cloud deployment models, composite design patterns, solution architectures spanning cloud and on-premises resources.

Purpose of studying of the discipline
The main objective of this course is to provide students with a basic level understanding of cloud computing modeling, design, deployment, etc.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Lists methods and techniques for managing IT projects.
2) Creates services based on big data analytics.
3) Plans to protect and ensure privacy of big data.
4) Demonstrates the ability to design information processes and systems using innovative tools, adapt modern ICT to the tasks of applied IS.
5) Lists the basics of cloud computing architectures and services.
6) Plans cloud computing architectures and services for enterprise information systems.

Prerequisites
Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Postrequisites
Final examination

Cloud Storage Infrastructure

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
Cloud infrastructure, data virtualization, network and software-defined storage, cloud storage, and software models are all covered in this course. Cloud drivers, benefits, and challenges, as well as service model, service level agreement (SLA), security, cloud services examples, and using cases, will be discussed in this course. The course covers data center design and management as well as software implementation.

Purpose of studying of the discipline
Provide an overview of storage and networking infrastructure for cloud environments.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Lists methods and techniques for managing IT projects.
2) Creates services based on big data analytics.
3) Plans to protect and ensure privacy of big data.
4) Demonstrates the ability to design information processes and systems using innovative tools, adapt modern ICT to the tasks of applied IS.
5) Lists the basics of cloud computing architectures and services.
6) Plans cloud computing architectures and services for enterprise information systems.

Prerequisites
Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Postrequisites
Final examination

Cloud Computing and Virtualization

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
Virtual machines have begun to replace physical computers (servers and desktops) in modern businesses. Companies can use a virtualization strategy to replace existing devices, lowering costs and supporting infrastructure. The course provides the basics of virtualization technologies at the modern level. The course focuses in detail on several types of virtualization such as storage-level, operating system-level, application-level, and enterprise-level virtualization.

Purpose of studying of the discipline
The main objective of this course is to provide students with advanced level understanding of cloud computing modeling, design, deployment, etc.

Learning Outcomes
ON 8 To have skills in using platforms such as HADOOP, SPARK, etc., big data and cloud systems, to have deep knowledge of database management to analyze data collections and to create documentation, to process large databases of large-scale machine learning, to create configurations for cloud server systems and clients

Learning outcomes by discipline
1) Lists methods and techniques for managing IT projects.
2) Creates services based on big data analytics.
3) Plans to protect and ensure privacy of big data.
4) Demonstrates the ability to design information processes and systems using innovative tools, adapt modern ICT to the tasks of applied IS.
5) Lists the basics of cloud computing architectures and services.
6) Plans cloud computing architectures and services for enterprise information systems.

Prerequisites
Data Science Data Mining Concepts and Techniques Introduction to Data Warehousing Fundamentals

Postrequisites
Final examination

IoT cloud infrastructure

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course provides an overview of the concepts, infrastructures, and capabilities of the Internet of Things (IoT) and cloud computing. This will help students gain the necessary knowledge to create IoT systems and use cloud services to process and store data generated by IoT devices. Emphasis will be placed on the architecture and design of IoT systems, the various technologies (wireless/ mobile/ sensor) driving the implementation of the system, and the transfer of data to the cloud for processing.

Purpose of studying of the discipline
Obtaining theoretical knowledge and practical skills in the architecture of cloud technologies, methods and features of designing cloud services, as well as obtaining application development skills for the main existing cloud platforms.

Learning Outcomes
ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline
1) Lists the principles of organization and functioning of the Internet of Things.
2) Explores the main factors in the development of the Internet of Things.
3) Uses existing technologies in the field of the Internet of Things.
4) Creates complete IoT systems (including end devices, network connection, data exchange, cloud platforms, data analysis).
5) Demonstrates skills in creating a software solution for data processing and storage using cloud technologies.

Prerequisites
Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Postrequisites
Final examination

Internet of Things

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
This course explores the areas, technologies, tools, and business opportunities associated with perceiving and connecting people, places, and things. Powerful, connected, always-on sensors and devices, coupled with sophisticated cloud infrastructure, are rapidly becoming the focus of new product and service development. Graduates will possess a unique combination of knowledge in a new and exciting field.

Purpose of studying of the discipline
The goal of mastering the discipline "Internet of Things" is for students to study the general characteristics of the technological phenomenon of the Internet of Things (IoT), the principles of design of socio-technical systems based on modern IoT technologies for automating various processes and routine operations.

Learning Outcomes
ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline
1) Lists the principles of organization and functioning of the Internet of Things.
2) Explores the main factors in the development of the Internet of Things.
3) Uses existing technologies in the field of the Internet of Things.
4) Creates complete IoT systems (including end devices, network connection, data exchange, cloud platforms, data analysis).
5) Demonstrates skills in creating a software solution for data processing and storage using cloud technologies.

Prerequisites

Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Postrequisites

Final examination

Performance and security in IoT

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course provides students with information about the basics of IoT security, countermeasures, and design based on its applications and platforms. The course covers important topics such as IoP applications, HTTP and MQTT performance, firmware upgrades, cryptographic techniques, data privacy fundamentals, and design best practices. At the end of the course, students will be able to implement security controls and ensure application platform performance.

Purpose of studying of the discipline

The goal of the discipline is to develop the ability to develop hardware and software for IoT systems to stimulate innovation in the field of digitalization of industry.

Learning Outcomes

ON 10 To plan and to implement network infrastructure, to manage Windows and Linux platform for the smooth operation of the organization, to develop IoT systems with in-depth knowledge of UI/UX design, to handle data communication hardware such as servers, switches, routers, etc

Learning outcomes by discipline

1) Lists the principles of organization and functioning of the Internet of Things.
2) Explores the main factors in the development of the Internet of Things.
3) Uses existing technologies in the field of the Internet of Things.
4) Creates complete IoT systems (including end devices, network connection, data exchange, cloud platforms, data analysis).
5) Demonstrates skills in creating a software solution for data processing and storage using cloud technologies.

Prerequisites

Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Postrequisites

Final examination