EDUCATIONAL PROGRAM

6B06 - Information and Communication Technologies
(Code and classifcation of the feld of education)

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

0610
(Code in the International Standard Classifcation of Education)

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

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

Bachelor
(Level of preparation)

Semey

Educational program

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)

Semey 2023

PREFACE

Developed

The educational program 6B06105 - Computer Engineering and Software/ Smart Computing in the direction of preparation 6B061 - Information and communication technologies on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymhan Gulnur	Dean of the Faculty of engineering and Technology	
Educational program manager	Kurushbayeva Dinara	Senior Lecturer of the Department of Automation, Information Technologies	
Member of the AC	Bekbayeva Roza	Senior Lecturer of the Department of Automation, Information Technologies	
Member of the AC	Daurembekova Umyt	Head of the Department of Information Technology, Communications and Information Security of JSC Semey Engineering	
Member of the AC	Akshabaeva Makhabbat	Student of the BSC 201 group	
Member of the AC	Jumenov Allabergen	Student of the BSC 201 group	
Member of the AC	Kdirbaev Ayan	Director of Kigros LLP	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Khalilov Shamil	Technical Director of iMAS GROUP LLP	

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 No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Content

1.Introduction

1.1.General data

The educational program 6B06105 "Computer Engineering and Software / Smart Computing", implemented by the SKACC International Faculty of the Shakarim State University of Semey city in terms of bachelors degree, was developed taking into account the needs of the regional and national labor market, the requirements of regulatory documents of the Ministry of Education and Science of the Republic of Kazakhstan and represents is a system of documents for organizing the educational process.

Educational program 6B06105 "Computer Engineering and Software / Smart Computing" prepares students to become professionals in the field of information technology, allowing them to apply theoretical and practical knowledge in the real world. Provides students with IT knowledge to make them suitable for starting their careers in the IT industry as software developers, IT infrastructure specialist, database administrator, cybersecurity experts, big data analysts, web designers and etc.

A graduate, having mastered such qualities, has the opportunity to create new and innovative ideas in the field of IT at enterprises of the Republic of Kazakhstan and abroad.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of bachelors is the development by students of at least 205 credits of theoretical training, as well as at least 27 credits of practice, 8 credits of final certification.

Total 240 credits.

1.3.Typical study duration: 4 years.

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	To educate and to prepare students to become IT professionals by enabling them to apply theoretical and practical knowledge in the real world. To provide students with IT knowledge to make them fit to start their careers in the IT industry as software developers, IT infrastructure specialist, database administrator, cybersecurity experts, big data analytics, web designers and etc. A graduate, having mastered such qualities, has the opportunity to create new and innovative ideas in the field of IT at enterprises of the Republic of Kazakhstan and abroad.
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B06 - Information and Communication Technologies
Code and classification of the direction of training	6B061 - Information and communication technologies
Code in the International Standard Classification of Education	0610
Code and classification of the educational program group	B057 - Information technology
Code and name of the educational program	6B06105 - Computer Engineering and Software/Smart Computing
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor in Information and Communication Technologies in the educational program 6B06105 "Computer Engineering and Software / Smart Computing"
Name of the profession / list of positions of a specialist	Software developer, IT infrastructure specialist, database administrator, cybersecurity expert, big data analyst, web designer, etc.
OQF qualification level (industry qualification framework)	6
Area of professional activity	The area of professional activity of a specialist: ⬚ Information and communication ⬚ IT industries
Object of professional activity	The objects of professional activity of graduates are enterprises and organizations of various forms of ownership that develop, implement and operate information systems in various fields of human activity. Objects of professional activity under the Educational program: - computers, complexes, systems and networks; - computer systems for information processing and management; - computer-aided design systems; - software for computer facilities and information systems.
Types of professional activity	Graduates of the educational program "Computer Engineering and Software / Smart Computing" can carry out the following professional activities: ⬚ design and engineering; ⬚ production and technological; ⬚ experimental research; ⬚ organizational and managerial;

	⬚ operational.
Graduate Model	The graduate of the educational program 6B06105 - "Computer engineering and software/ Smart Computing" has the following competencies: - Competencies in the field of professional communication in a multilingual environment. - A stable worldview and a clear civic position based on interdisciplinary connections. - Ability to solve standard tasks of professional activity with the use of information and communication technologies, to use the basic laws of natural science and general technical disciplines in professional activity. - Analyze the main ideological and methodological problems, including interdisciplinary ones. - Know programming languages, such as C and C++, to work in the development of various programs and video games. - The ability to identify intrusion detection using cybersecurity standards. - Has the ability to plan and implement network infrastructure. - The ability to develop mobile applications using Android Studio. Can write programs in Java, C++, C, HTML, CSS, etc.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31161 (3023443)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students` intercultural and communicative competencies at B1 level. The discipline is aimed at mastering the knowledge, skills and abilities that allow using a foreign language in interpersonal communication and professional activity. All types of speech activity are taught, such as reading, writing, listening and production of texts of level complexity with a certain degree of grammatical and lexical correctness.

Purpose of studying of the discipline
Formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level (A2, pan-European competence) and the level of basic sufficiency (B1, pan-European competence). Depending on the level of training, the student at the time of completion of the course reaches the B1 level of the pan-European competence if the language level of the student at the start is higher than the A2 level of the pan-European competence.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Information and communication technology

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31947 (3023444)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline
Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	31949 (3023537)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti- corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline
It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students` basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	33403 (3024552)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline
The purpose of the program is to form the socio- humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31948 (3023449)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes

ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites

School course

Postrequisites

Physical Culture

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31957 (3023446)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline

Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

Learning Outcomes

ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites

Kazakh language

Postrequisites

Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31956 (3023445)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and

communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline
Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31959 (3023531)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline
The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline
The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Final examination

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31960 (3023535)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline
The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning

outcomes as formed abilities.
Purpose of studying of the discipline
Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".
Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	33406 (3024553)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.
Purpose of studying of the discipline
The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.
Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.
Prerequisites
Russian language
Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31958 (3023450)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.
Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.
Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.
Prerequisites
Physical Culture

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	31996 (3023451)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
Physical Culture

Postrequisites
Physical Culture

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33007 (3023538)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiev, which form worldview and aesthetic values, the student`s ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai`s heritage, the significance of his works for history, literature and science are determined.

Purpose of studying of the discipline
Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiuly, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	33035 (3023536)
Course	2
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline

Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

Learning Outcomes

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

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	33030 (3023452)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio- cultural experience and socio- cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

Learning Outcomes

ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites

Physical Culture

Postrequisites

Basic and profile disciplines of the EP

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	33408 (3023448)
Course	3
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-

consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline
Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

Learning Outcomes
ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.

Prerequisites
History of Kazakhstan The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites
Basic and profile disciplines of the EP

Module 2. Intercultural communication

Korean I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31955 (3023462)
Course	1
Term	1
Credits count	6
Practical and seminar classes	60hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The course is designed to form students` communicative competencies in the Korean language. The course is divided into 4 levels.
"Korean 1" is aimed at getting acquainted with the main phonological, morphological and syntactic characteristics of the Korean language. An introductory phonetic course is conducted and articulatory properties and intonation are studied. Students receive information about the alphabet, learn the basics of alpha-syllabic writing and core vocabulary.

Purpose of studying of the discipline
The purpose of this course is to master and consolidate knowledge and competencies in the field of modern Korean language - standard phonetics, graphics, grammar and vocabulary to the extent provided for in this program.

Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites
School course

Postrequisites
Korean II

Multicultural Studies

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31951 (3023454)
Course	1
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course helps students understand and expand their knowledge of the different cultures around them. Given globalization and localization, to be a professional in the future, you need to become a multicultural person who approaches everything with an open mind. Students will become familiar with other cultures with an understanding of their own biases and prejudices. But they will be open to understanding with others and should develop their own identity.

Purpose of studying of the discipline
Multicultural learning complements a student`s overall educational experience, covering a wide range of perspectives on cultural experiences in Kazakhstan, the United States, and other countries.

Learning Outcomes

ON 1 To demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, to apply information technologies, taking into account current trends in the development of society.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Statistics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31950 (3023453)
Course	1
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course will introduce students to the basic concepts and methods of probability theory and statistics. It provides an overview of the main probability distributions: the binomial distribution, the normal distribution, and the sampling distribution. This will help students become familiar with statistical methodologies for analyzing quantitative and qualitative data, such as interval estimation, hypothesis testing, regression analysis, categorical data analysis, and analysis of variance, which can be used to solve real- world statistical problems.
Purpose of studying of the discipline
Mastering the competencies necessary for training personnel who possess a modern methodology for collecting, processing, and summarizing statistical information
Learning Outcomes
ON 4 To analyze the main world outlook and methodological problems, including cross-disciplinary ones, arising in science at the present stage of its development as well as to use its results in professional activities
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Korean II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31962 (3023463)
Course	1
Term	2
Credits count	6
Practical and seminar classes	60hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
Students learn to create sentences using an 800-word vocabulary and basic grammar structures. Topics are the phrase structure and the choice of lexical units; Chinese and European borrowings; polite formal style. By the end of the first year, students complete A1 (survival level) of the "Common European Framework of Reference for Languages" or Level 1 of 6 of the TOPIK Korean National Exam.
Purpose of studying of the discipline
Acquisition of knowledge and competencies in the field of the modern Korean language - phonetics, normative grammar and vocabulary in the amount provided for by this program.
Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.
Prerequisites
Korean I
Postrequisites
Korean III

Korean III

Discipline cycle	Basic disciplines

Discipline component	University component
SubjectID	33008 (3023464)
Course	2
Term	1
Credits count	6
Practical and seminar classes	60hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

In this discipline, students master a certain array of vocabulary (1500-2000 words), common speech turns and idiomatic expressions of the language, which are typical for monologue and dialogic written and oral speech. Most of the situations that arise during your stay on the Korean Peninsula (bank, market, post office, etc.) are considered. Students master the skills of telling about their intentions and dreams, assessing events, and briefly substantiating their views.

Purpose of studying of the discipline

Acquisition of knowledge and competencies in the field of the modern Korean language - phonetics, normative grammar and vocabulary in the amount provided for by this program.

Learning Outcomes

ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites

Korean II

Postrequisites

Korean IV

Korean IV

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33031 (3023465)
Course	2
Term	2
Credits count	6
Practical and seminar classes	60hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline prepares students for studying in South Korea. In addition to intensive language training, information about the culture, history and current situation of South Korea is provided through multimedia.

By the end of the second year, students on average complete A2 level (pre-threshold level) of the "Common European Framework of Reference for Languages" or Level 2 of 6 of the TOPIK Korean National Exam.

Purpose of studying of the discipline

Acquisition of knowledge and competencies in the field of the modern Korean language - phonetics, normative grammar and vocabulary in the amount provided for by this program.

Learning Outcomes

ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites

Korean III

Postrequisites

Basic and profile disciplines of the EP

Module 3. Games Development

System Analysis & Design

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31963 (3023467)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours

Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course examines the processes, methods, and problems related to the analysis and design of information systems. Requirements analysis, system development life cycle, structural design, feasibility study, installation and implementation are some of the topics covered. To effectively participate in the creation and maintenance of systems, any IT graduate working in the IT sector must have knowledge and possess the necessary abilities in systems analysis and design.

Purpose of studying of the discipline
To provide students with knowledge of the basics of system analysis and its methods. Provide design skills using systems analysis.

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

Prerequisites
Discrete Mathematics with Applications

Postrequisites
Fundamentals of information security

Educational practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31964 (3023474)
Course	1
Term	2
Credits count	2
Study practics	60hours
Total	60hours
Knowledge control form	Total mark on practice

Short description of discipline
The student gets acquainted with the organization and activities of the enterprise according to the profile of the educational program and receives a primary idea of the scope of future professional activity.

Purpose of studying of the discipline
Give students an initial idea of the field of professional activity

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

Prerequisites
Programming Language I

Postrequisites
Internship I

Games Theory and Implementation

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32721 (3023475)
Course	2
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course provides students with an understanding of the process of developing and implementing computer games. The course provides the basic principles of the theory and logic of the game development process, digital interactions, player interaction, storytelling, and so on. This discipline introduces students to game engines and the game development environment, develops practical skills in assessing and using the resources necessary for the development and implementation of games.

Purpose of studying of the discipline
The goal of the discipline is to develop in students systematized knowledge in the field of decision-making theory based on the use of methods for solving matrix, convex, non-antagonistic and positional games and an understanding of the mathematical and logical foundations of modern information technologies and, on this basis, a holistic picture of the world.

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

Computer Graphics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33032 (3023484)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This module provides the learner with knowledge of various concepts, techniques and algorithms used in computer graphics. The module has great professional potential, especially for students who are interested in studying industrial design, gaming technology and networking.

Purpose of studying of the discipline
Teach industrial design technologies, gaming technologies and animation

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

Prerequisites
Games Theory and Implementation Object-Oriented Programming with Java

Postrequisites
2D Computer Animation

Internship I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33034 (3023498)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline
Студент кәсіпорында тәжірибелік сабақтар кезінде алған теориялық білімін практикалық іс-әрекеттермен бекітеді, сонымен қатар қажетті дағдыларды меңгереді.

Purpose of studying of the discipline
Mastering the methodology of design, implementation and operation of individual tasks and subsystems of information systems, studying automated tools and systems that implement information systems, acquiring skills in research and design of information system subsystems.

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

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Basic and profile disciplines of the EP

2D Computer Animation

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33457 (3023492)
Course	3
Term	1
Credits count	5
Lections	15hours

Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course examines the prospects for the development of computer technology. Students will be trained in the tools and techniques used to model, process, capture, display and store 2D and 3D scenes, digital photographs, animation and video. In addition, students will gain practical skills in working with 3D modeling and animation software. Students will be required to complete assignments that demonstrate their understanding of the program, concept development, and implementation.

Purpose of studying of the discipline
The purpose of the discipline is to form students` ideas about the tools and approaches associated with the development of computer animation. Obtaining theoretical and practical knowledge about computer animation.

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

Prerequisites
Computer Graphics

Postrequisites
Computer Games Programming & Game Engine Fundamentals of game design Game development for mobile platforms

Fundamentals of game design

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33418 (3023508)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 best practices in iteration and play testing, students will create new prototypes and games. 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

Prerequisites
2D Computer Animation

Postrequisites
Virtual Reality

Computer Games Programming & Game Engine

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33420 (3023507)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course will focus on using programming to further enhance the gameplay experience, such as using C++ to control elements of a computer game. It also covers computer game development, gaming careers - the skills and knowledge that students will need to work in the games industry, and 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

Prerequisites
2D Computer Animation

Postrequisites
Virtual Reality

Game development for mobile platforms

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33421 (3023509)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

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

Prerequisites
2D Computer Animation

Postrequisites
Virtual Reality

Virtual Reality

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33429 (3023502)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Бұл курс OpenGL, нақты уақыттағы рендеринг, 3D рендеринг жүйелері, дисплей оптикасы мен электроникасы, инерциялық өлшеу модульдері, бақылау, хаптика, графикалық құбыр желісі, адам мен тереңдіктің көп модельді қабылдауы, стерео рендеринг және қатысу сияқты тақырыптардың кең ауқымын қамтиды. Курс нақты әлемдегі бағдарламалау қиындықтары мен виртуалды шындық технологияларына баса назар аударады. Студенттің өзінің виртуалды ортасын құру курстың соңғы міндеті болып табылады.

Purpose of studying of the discipline
Train to develop IoT systems with deep knowledge in UI/UX design

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

Prerequisites
Computer Games Programming & Game Engine Fundamentals of game design Game development for mobile platforms

Postrequisites
3D Modelling

3D Modelling

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33437 (3023520)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course introduces students to 3D computer generated image (CGI) software and how it works. The course covers CGI modeling techniques, texturing, lighting, rendering and animation. Discusses ways to integrate 3D computer images into digital media. Students learn programming techniques using OpenGL for 3D graphic design. Familiarization with the principles of constructing dynamic objects and their application in practice.

Purpose of studying of the discipline
Obtaining theoretical knowledge and practical skills in the field of software and hardware organization of multimedia systems.

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

Prerequisites
Virtual Reality

Postrequisites
Final examination

Module 4. Big Data & Cloud Computing

Discrete Mathematics with Applications

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31954 (3023458)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This subject is a mathematics course designed specifically for students of computer science and software engineering. The course covers logic, set theory, relations, graph theory, etc. The course will cover various topics such as mathematical induction, inductive hypothesis, mathematical logic. Mathematical proofs, relational functions, mappings, graphs and abstract algebra (binary operations, commutative and associative operations, etc.).

Purpose of studying of the discipline
To familiarize the student with the basics of discrete mathematics as a theoretical basis for programming.

Learning Outcomes
ON 2 To demonstrate competencies in the field of business (professional) communication in a multilingual environment, as well as to have a look at the general culture of the world.

Prerequisites
School course

Postrequisites
Decision Support Systems

Information Systems

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31953 (3023457)
Course	1
Term	1
Credits count	5

Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

In this course, students will learn the basic concepts of business technology in electronic form. After completing the training, students will acquire practical skills in the field of information systems, organization of hardware and software, organization of storage and processing of data and information. Students will gain an understanding of e-business concepts, applications and technologies such as electronic payment systems, ATMs and cards.

Purpose of studying of the discipline

The purpose of mastering the discipline is to develop students' professional competencies in the field of modern information technologies.

Learning Outcomes

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

Prerequisites

School course

Postrequisites

Computer & Information Security

Fundamentals of algorithmization

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31751 (3023566)
Course	1
Term	1
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course is designed for students to master the issues of constructing algorithms and programs for various tasks. The course covers topics such as problem statement, the main stages and ways of solving problems: mathematization, algorithmization, programming, debugging and program execution.

The development of computer programs is carried out according to a certain rule, the stages of which are: formulation of the problem; creation of the program project; creation of the model; construction of the algorithm; implementation of the algorithm; research of the algorithm and its complexity; testing of the program; documentation.

Purpose of studying of the discipline

The purpose of the discipline is to study the basics of algorithmization for solving programming problems. It is important for a modern programmer not only to have knowledge about the principles of computer operation and the capabilities of its software, he must also be able to formulate a problem, create its mathematical and software model, know various ways to solve the problem, be able to analyze the resulting solution.

Learning Outcomes

ON 5 To use various support programs, best practices and functions that are necessary for professional development
ON 6 To use the basic laws of natural sciences in professional activities, methods of mathematical analysis and modeling, theoretical and experimental research

Prerequisites

School course

Postrequisites

Programming Technologies

Programming Language I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31952 (3023455)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours

Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this course, students will gain knowledge of the fundamentals of programming languages and become familiar with the theory, design, and implementation of programming languages. This course provides a deep and basic understanding of how the basic processes of computer programming work. The course is very useful for freshers who want to pursue a career in a leading IT company. Learning C programming always gives a clear insight into learning a more advanced high-level language.

Purpose of studying of the discipline
The goal of the discipline is to develop the ability to master techniques for using software to solve practical problems. Obtaining knowledge and programming skills in a high-level language, independent acquisition with the help of information technology and the use of new knowledge and skills in practical activities.

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

Prerequisites
School course

Postrequisites
Programming Language II

Software Architecture

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31966 (3023872)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The Software Architecture course is designed to familiarize students with the general principles of software design and specific implementations of these principles in programming. The discipline teaches you to reasonably select tools to achieve the required level of program performance, and also instills skills that are associated with the operation and maintenance of hardware 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

Prerequisites
Fundamentals of algorithmization

Postrequisites
Object-Oriented Programming with Java

Software Design

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31967 (3023873)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course "Software Design" develops 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
Prerequisites
Fundamentals of algorithmization
Postrequisites
Object-Oriented Programming with Java

Programming Technologies

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	31965 (3023870)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 software manufacturability. This course covers the most common techniques and methods used in programming processes, as well as common problems encountered in them.
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
Prerequisites
Fundamentals of algorithmization
Postrequisites
Object-Oriented Programming with Java

Programming Language II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31961 (3023456)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course provides students with a basic understanding of how to apply the basic concepts of procedural programming to the C++ programming language. This course covers programming principles and structures such as data types, classes, objects, constructors, abstract classes, polymorphism, encapsulation, and inheritance. This course is very useful for entry level students who want to further their career in a world class IT company and learn about smart computing.
Purpose of studying of the discipline
The objectives of the course are to familiarize students with the vocabulary of the language, its syntactic constructions and the standard library of the language; to familiarize them with the ways of processing information using the means of the programming system.
Learning Outcomes
ON 5 To use various support programs, best practices and functions that are necessary for professional development
Prerequisites
Programming Language I
Postrequisites
Computer & Information Security

Operations Research

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31995 (3023874)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline develops the student`s theoretical knowledge and practical skills on issues related to management decision- making; teaches the use of operations research methods and models in the process of preparing and making management decisions.
According to the requirements for training in this educational program, students must have knowledge in the field of research of mathematical and software models of computational processes, methods of algorithmization and implementation of models, analyze and optimize processes in control systems.

Purpose of studying of the discipline
The goal of the discipline is to master the basic ideas of methods, features of areas of application and methods of using them as a ready-made tool for practical work in the design and development of systems, mathematical data processing, construction of algorithms and organization of computational processes.

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

Prerequisites
Programming Technologies Software Architecture Software Design

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

Operating system concepts and network management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33009 (3023480)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 management, concurrency, low-level and high-level IPC, deadlock detection and recovery, and memory management. The course describes communication models, local and global networks, client- server systems; covered issues of network management, data transmission reliability, 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

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
Discipline component	Electives
SubjectID	33013 (3023478)
Course	2

Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Understanding and optimizing operating system performance is an important requirement for computer science students. Software developers, systems support administrators, network and database administrators all require a good understanding of operating system concepts to work efficiently and cost-effectively. Students will gain an understanding of the factors that must be considered 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

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
Discipline component	Electives
SubjectID	33014 (3023479)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

A computer system consists of hardware and software that work together to perform useful work. In this course, students will explore programming issues in a real computer system, learning the abstractions, interfaces, and design decisions that affect how that software works. The course will give students a clear 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

Prerequisites

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

Postrequisites

Linux Operating Systems & Networking

RDBMS concepts and Oracle

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33037 (3023488)
Course	2
Term	2
Credits count	5
Lections	15hours

Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

During the course, students will become familiar with the concept of "database", types of databases, study in detail the relational data model, and the stages of designing relational databases. At the user level, they master the Oracle Database 11g database management system. The course provides quality control of acquired knowledge in the form of express control and unit tests. Lectures will include practical group lessons 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

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
Discipline component	Electives
SubjectID	33036 (3023487)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 distributed database design and management. In addition, the course introduces the challenges of distributed data management, especially in the case of heterogeneous databases. The course will cover the most widely used systems and techniques 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

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
Discipline component	Electives
SubjectID	33057 (3023486)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course will teach students the specific techniques and practices needed to design and implement database systems. The Database Management Systems course is currently the dominant system for marketing, scientific and engineering applications. This course covers the data structure model, standardization, 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

Prerequisites

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

Postrequisites

Artificial Intelligence Artificial intelligence and expert systems Artificial Neural Networks

Parallel and Distributed Computing

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	33516 (3023493)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Modern computer systems are distributed and parallel. This course covers general introductory concepts in the design and implementation of parallel and distributed systems, covering all major industries such as cloud computing, grid computing, cluster computing, supercomputing, and multi-core computing. Topics that will be covered in this course include asynchronous/synchronous computing/communications, concurrency control, fault tolerance, etc.

Purpose of studying of the discipline

Provide an integrated understanding of various aspects of distributed and parallel computing using various techniques and concepts.

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

Prerequisites

Discrete Mathematics with Applications

Postrequisites

Final examination

Introduction to Data Warehousing Fundamentals

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33430 (3023516)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

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

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
Discipline component	Electives
SubjectID	33431 (3023515)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The study of algorithms and mathematical modeling that enable computers to identify patterns in database systems, make predictions, and improve their performance by sharing data is known as data mining. The course will particularly focus on machine learning techniques as they provide specialized tools for knowledge extraction. Data warehousing 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

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
Discipline component	Electives
SubjectID	33432 (3023514)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course will provide an overview of applications, market trends, and lessons that can be learned using major platforms such as Hadoop, Spark, and others. 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 to work 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

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

Introduction to Cloud Architecture

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33454 (3023523)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 common cloud deployment models, cloud characteristics, to an advanced level, covering topics such as , 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

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

Postrequisites
Final examination

Cloud Storage Infrastructure

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33438 (3023524)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course covers cloud infrastructure, data virtualization, network-attached and software-defined storage, cloud storage, and software models. Cloud drivers, benefits and challenges, as well as service model, service level agreement (SLA), security, cloud service examples and use 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

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

Postrequisites
Final examination

Cloud Computing and Virtualization

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33459 (3023522)

Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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, reduce costs, and maintain 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

Prerequisites

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

Postrequisites

Final examination

Module 5. Cyber Security & Privacy

Introduction to Information Technology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33015 (3023460)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 communication systems, 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

Prerequisites

School course

Postrequisites

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

Computer & Information Security

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33016 (3023459)
Course	2
Term	1
Credits count	5
Lections	15hours

Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 combat them. Course topics also include an overview of the entire information security industry and detailed information on many related topics. This course covers the field`s terminology, industry history, and 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

Prerequisites
School course

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

Fundamentals of information security

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33017 (3023461)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 corresponding countermeasures, instructions for ensuring the security of equipment, data and software, including physical security, backup procedures, firewalls, encryption methods and virus protection are discussed.

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

Prerequisites
School course

Postrequisites
Network Infrastructure and Management Cryptography and Cyber Security Introduction to cyber criminology

Introduction to cyber criminology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33038 (3023490)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 cybercrimes and their impact on their victims, be it an individual, an institution or a society. This course focuses on online digital devices and how to recognize and protect yourself from online crime activities through practical steps.

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

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
Discipline component	Electives
SubjectID	33039 (3023489)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course covers the fundamentals of modern cryptographic protocols and their applications for electronic 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. The course is devoted to the basics of modern cryptographic protocols and their application for electronic voting, digital currency, sensor networks, IoT, IoV, smart home, etc. The course presents symmetric and asymmetric cryptographic systems and the most important parts cryptology, including a variety of 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

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
Discipline component	Electives
SubjectID	33040 (3023491)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course focuses on the principles and techniques of encryption and network security. Classical systems, symmetric block cryptography (DES, AES and other modern symmetric cryptography), linear and differential cryptographic analysis, perfect 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
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

Artificial Neural Networks

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33411 (3023501)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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-world 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
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
Discipline component	Electives
SubjectID	33409 (3023499)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Artificial intelligence is a research field that studies ways to implement intelligent human behavior in 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: ways to solve problems, building a chain of reasoning, planning and understanding human speech, self-programming, computer vision systems, 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
Prerequisites
Operating system concepts and network management Database Management Systems Distributed and centralized database

Artificial intelligence and expert systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33410 (3023500)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 basic elements of computational intelligence. The course will cover the following major topics: search, logical representation and reasoning, computer-aided 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

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

Fraud and countermeasures in IT and telecommunications

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33422 (3023512)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 different 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

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

Postrequisites
Ethical Hacking

Basics of Cyber Forensic

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	33423 (3023511)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course introduces the principles and practice of cyber forensics, including cyber investigations, data and file recovery techniques, and digital forensic analysis and invalidation. Topics include data mining, 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; and cyber intrusion investigation tools and techniques.

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

Prerequisites

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

Postrequisites

Ethical Hacking

Digital Forensics and Investigations

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33425 (3023510)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course will introduce students to computer forensics, its fundamentals, and best practices for incident response. Students will learn to understand the legal aspects of computer forensics as well as its relationship 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 forensic science principles and practices 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

Prerequisites

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

Postrequisites

Ethical Hacking

Decision Support Systems

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	33426 (3023495)
Course	3
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours

Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Through this course, students will learn how to manage and use decision support systems. Ways of using DSS capabilities in various decision-making processes are considered. Topics covered in this course are Decision Support Systems Overview, Modeling and Support, DSS Concept, Methodology and Technologies, Modeling and Analysis, Data Mining, Data Storage, Group Support Systems, Knowledge Management, Artificial Intelligence and Expert Systems.

Purpose of studying of the discipline
To give an idea of the decision support system

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

Prerequisites
Discrete Mathematics with Applications

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

Ethical Hacking

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	33433 (3023503)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The main purpose of the course is to familiarize students with the principles of hacker ethics. The course covers codes of conduct and ethics of the attacking system. Students gain a basic understanding of the hacker`s mindset and the basic elements that penetrate computer systems with the express purpose of protecting them from criminals. The course makes a very clear distinction between ethical and criminal hacking and gives tools to prevent and protect the system from cyber criminals

Purpose of studying of the discipline
The purpose of studying the discipline is to lay a terminological foundation, teach how to correctly analyze information security threats, perform the main stages of solving information security problems, consider the basic methodological principles of the theory of information security, study methods and means of ensuring information security, methods of violating the confidentiality, integrity and availability of information.

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

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

Postrequisites
Final examination

Module 6. Ubiquitous internet of things

Computer communication and networking

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33041 (3023482)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Users browse the web, check email, make VoIP phone calls, and participate in video conferencing via computers. All these applications are made possible by networking computers together. This course is designed to give students a clear understanding of how networks are built and how they allow computers to be used to share 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

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
Discipline component	Electives
SubjectID	33054 (3023481)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course introduces the concepts and technologies used in computer network management. Students create, report on, and implement complex network environments, including security, and configure network management systems to monitor and troubleshoot network devices, and configure and use software to maintain and troubleshoot 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

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
Discipline component	Electives
SubjectID	33056 (3023483)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course focuses on the design, installation, configuration and operation of local area 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

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

Wireless Networks and Ubiquitous Computing

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33416 (3023504)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course will give students 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 could 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

Prerequisites
Network Administration and Design

Postrequisites
Advanced Web Technology Mobile Computing Internet Application and Multimedia

Microwave communication

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33413 (3023505)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course covers the fundamentals of microwave circuit design and analysis, from principles of electromagnetic theory to radar system design. Emphasis is placed on wireless communication system design and high data rates. The course begins with an overview of electromagnetic theory and then introduces students to the design of passive and active microwave circuits using sophisticated high-frequency software.

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

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
Discipline component	Electives
SubjectID	33417 (3023506)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 systems, UMTS and GSM, are also discussed in the course. It also discusses how mobile radio wave propagation affects and limits the performance of digital communications systems. A description is given of various methods for sharing resources in mobile communications and methods for calculating the throughput of systems.

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

Prerequisites
Network Infrastructure and Management

Postrequisites
Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Linux Operating Systems & Networking

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33427 (3023496)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course is an introduction to the Linux operating system, primarily focused on using the command line. It is well known that the Internet is a global network that is profoundly changing social, political and economic systems, and in some cases, erasing geographical boundaries. Designing and managing such a network requires an understanding of how network behavior and protocols can be implemented in the operating system.

Purpose of studying of the discipline
The purpose of the discipline is to study the problems of administering Linux servers, the classification of operating systems and the software used for administering Linux servers, as well as the theoretical and practical foundations of administering local networks based on Linux operating systems.

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

Prerequisites
Operating Systems System software Operating system concepts and network management

Postrequisites
Final examination

Internship II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33424 (3023513)
Course	3
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline
The student consolidates the acquired theoretical knowledge with practical actions during practical training at the enterprise, and also acquires the necessary skills.

Purpose of studying of the discipline
Mastering the methodology of design, implementation and operation of individual tasks and subsystems of information management systems, studying automated systems that implement information systems, acquiring skills in research and design of information system subsystems.

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

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Basic and profile disciplines of the EP

IoT cloud infrastructure

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33439 (3023526)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 system implementation, and moving 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

Prerequisites
Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Postrequisites
Final examination

Internet of Things

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33440 (3023525)
Course	4
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course explores the areas, technologies, tools, and business opportunities associated with sensing and connecting people, places, and things. Powerful, connected and always- on sensors and devices coupled with sophisticated cloud infrastructure are quickly becoming the focus of new product and service development. Graduates will have 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

Prerequisites
Advanced Web Technology Mobile Computing Internet Application and Multimedia

Postrequisites
Final examination

Performance and security in IoT

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33441 (3023527)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course provides students with knowledge of IoT security fundamentals, countermeasures, and design around 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. Upon completion 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

Prerequisites
Advanced Web Technolology Mobile Computing Internet Application and Multimedia

Postrequisites
Final examination

Module 7. Mobile & web development

Computer Architecture and Digital Systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32800 (3023471)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours

Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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 and Thread Level Parallelism), Assembly Language Programming, Performance Metrics (Performance, Power, Power, 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

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
Discipline component	Electives
SubjectID	31997 (3023473)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course covers the fundamentals of computer structure, with an emphasis on low-level computer abstractions such as digital logic, instruction set, and assembly language programming. Data representation, digital logic, simplification of logic expressions, design and analysis of simple combinational circuits, design and analysis of simple synchronous sequential networks, 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

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

Object-Oriented Programming with Java

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33019 (3023477)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course aims to introduce students to the fundamentals of object-oriented programming using the Java programming language. Students will use several important APIs while learning Java programming skills. The emphasis in the course is on the object-oriented nature of the Java programming language and its use of elements of polymorphism. Hands-on exercises enable participants to become highly skilled Java application developers.

Purpose of studying of the discipline
Introduce students to programming in Java.

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

Prerequisites
Programming Language II

Postrequisites
Computer Graphics

Digital logic fundamentals

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	33020 (3023472)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course provides an introduction to the analysis and design of digital logic, which is the basis for computer hardware design. The course consists of three main sections. The first topic examines the number representations used in modern digital systems and discusses their arithmetic properties and conversion methods. The second section is devoted to the combinational theory of switching. The third section deals with the analysis and design of clocked sequential 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

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

Interfaces of computer systems

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	31994 (3023875)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline "Computer System Interfaces" teaches students modern methods and technologies for interprogram data exchange, programming interface system tasks for the Windows operating system, and software and hardware features for controlling computer equipment through a programming language.
Computer system interfaces are the basis for the interaction of all modern computing and information systems. If the interface of an object, any one, does not change, this makes it possible to change the object without changing the rules of its interaction with other objects.

Purpose of studying of the discipline
The purpose of the discipline is to train students in the field of creating interaction interfaces in computer systems based on modern computer technologies.

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

Prerequisites

Programming Technologies Software Architecture Software Design

Postrequisites

Web Applications Development

Web Applications Development

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	33458 (3023494)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The course focuses primarily on creating rich client web applications in the browser. The course is divided into various modules covering the following technologies in detail: Flash & Flex 3 (Adobe), AJAX (Asynchronous Javascript and XML), GWT (Google Web Toolkit), Silverlight (Microsoft) and JavaFX. Several applications will be presented as case studies. Upon completion of this course, students will be proficient in the latest and widely used web application development methodologies.

Purpose of studying of the discipline

The purpose of the discipline is to study modern methods and software used in the development of web applications. As a result of studying the discipline, students must learn to develop software system projects based on an object-oriented approach to software design.

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

Prerequisites

Operating system concepts and network management Network Infrastructure and Management Network Administration and Design

Postrequisites

User Experience Design

User Experience Design

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	33428 (3023497)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

This course covers the basic concepts of user experience and interaction design. Course content includes concepts about fundamental concepts, practices, workflows, and tools associated with the practice of designing user interfaces on the web and mobile devices. Students acquire practical skills in designing and creating prototypes of user interfaces and frameworks; interactive design and testing processes.

Purpose of studying of the discipline

The purpose of studying the discipline is to acquire knowledge, skills and abilities in creating digital products, developing the appearance of websites and mobile applications, designing user experience and analyzing the target audience.

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

Prerequisites

Web Applications Development
Postrequisites
Android Application Development

Internet Application and Multimedia

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33434 (3023519)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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, 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
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
Discipline component	Electives
SubjectID	33435 (3023518)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course introduces concepts, techniques, and technologies related to user interfaces for mobile computing. Students should be able to evaluate, create, and study mobile computing artifacts at a level that allows them to independently contribute to commercial and academic projects. Topics range from more "traditional" views focused on smartphones and tablets, to new 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
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
Discipline component	Electives
SubjectID	33436 (3023517)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The course introduces modern client- and server-side web technologies concepts, principles and techniques. This course requires knowledge of basic web technologies such as HTML, HTTP, CSS, XML, JavaScript and others. This course focuses on advanced web technology concepts. These include extensions of web standards, combinations of Internet technologies, 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

Prerequisites
Wireless Networks and Ubiquitous Computing Microwave communication Mobile communication system

Postrequisites
Internet of Things IoT cloud infrastructure Performance and security in IoT

Pre-diploma practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33456 (3023529)
Course	4
Term	2
Credits count	15
Undergraduate practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline
Trainees will undergo practical internships lasting approximately four months in approved private and public companies. During the internship, students will be given an assignment that has been agreed upon by the faculty and the company. Internships may include feasibility studies, functional analysis, systems analysis and design, testing and implementation.

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

Prerequisites
Internship II

Postrequisites
Final examination

Internship III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	33455 (3023528)
Course	4
Term	2

Credits count	15
Working practice	450hours
Total	450hours
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

Prerequisites
Internship II
Postrequisites
Final examination

Android Application Development

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	33442 (3023521)
Course	4
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
This course provides hands-on experience and exposure to mobile application development for Android devices. Starting with the basics, this course builds a solid knowledge base about the architecture and internals of Android. Subsequently, he dives into advanced Android use cases (media processing, connectivity, social networking, etc.) that will help students create a working application on their own.

Purpose of studying of the discipline
Provide an introduction to Android application development techniques.

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

ON 12 To apply in practice the formed personality-oriented qualities that contribute to the ability to correctly express thoughts, to build evidence of one's point of view, to lead a discussion, to listen to another person, to demonstrate the ability to communicate and business communication skills

Prerequisites
User Experience Design
Postrequisites
Final examination

Final examination

Writing and defending a graduation project or preparing and passing a comprehensive exam..

Comprehensive exam

Credits count	8

Diploma project

Credits count	8

4.Summary table on the scope of the educational program
«6B06105 - Computer Engineering and Software/Smart Computing»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	30	15		35	70	Examination
Module 2. Intercultural communication										
Korean I	BS/US	1	6	180		60		40	80	Examination
Multicultural Studies	BS/US	1	5	150	30	15		35	70	Examination
Statistics	BS/US	1	5	150	30	15		35	70	Examination
Korean II	BS/US	2	6	180		60		40	80	Examination
Korean III	BS/US	3	6	180		60		40	80	Examination
Korean IV	BS/US	4	6	180		60		40	80	Examination
Module 3. Games Development										
System Analysis & Design	BS/US	2	5	150	15	30		35	70	Examination
Educational practice	BS/US	2	2	60						Total mark on practice

Games Theory and Implementation	BS/US	3	5	150	30	15		35	70	Examination
Computer Graphics	BS/US	4	5	150	15	30		35	70	Examination
Internship I	BS/US	4	5	150						Total mark on practice
2D Computer Animation	BS/US	5	5	150	15	30		35	70	Examination
Fundamentals of game design	BS/CCh	6	5	150	15	30		35	70	Examination
Computer Games Programming & Game Engine	BS/CCh	6	5	150	15	30		35	70	Examination
Game development for mobile platforms	BS/CCh	6	5	150	15	30		35	70	Examination
Virtual Reality	BS/US	7	5	150	15	30		35	70	Examination
3D Modelling	BS/US	8	5	150	15	30		35	70	Examination
Module 4. Big Data & Cloud Computing										
Discrete Mathematics with Applications	BS/US	1	5	150	15	30		35	70	Examination
Information Systems	BS/US	1	5	150	30	15		35	70	Examination
Fundamentals of algorithmization	BS/US	1	5	150	30	15		35	70	Examination
Programming Language I	BS/US	1	5	150	15	30		35	70	Examination
Software Architecture	BS/CCh	2	5	150	15	30		35	70	Examination
Software Design	BS/CCh	2	5	150	15	30		35	70	Examination
Programming Technologies	BS/CCh	2	5	150	15	30		35	70	Examination
Programming Language II	BS/US	2	5	150	15	30		35	70	Examination
Operations Research	BS/US	3	5	150	15	30		35	70	Examination
Operating system concepts and network management	BS/CCh	3	5	150	15	30		35	70	Examination
Operating Systems	BS/CCh	3	5	150	15	30		35	70	Examination
System software	BS/CCh	3	5	150	15	30		35	70	Examination
RDBMS concepts and Oracle	BS/CCh	4	5	150	15	30		35	70	Examination
Distributed and centralized database	BS/CCh	4	5	150	15	30		35	70	Examination
Database Management Systems	BS/CCh	4	5	150	15	30		35	70	Examination
Parallel and Distributed Computing	AS/US	5	5	150	15	30		35	70	Examination
Introduction to Data Warehousing Fundamentals	AS/CCh	7	5	150	15	30		35	70	Examination
Data Mining Concepts and Techniques	AS/CCh	7	5	150	15	30		35	70	Examination
Data Science	AS/CCh	7	5	150	15	30		35	70	Examination
Introduction to Cloud Architecture	BS/CCh	8	5	150	15	30		35	70	Examination
Cloud Storage Infrastructure	BS/CCh	8	5	150	15	30		35	70	Examination
Cloud Computing and Virtualization	BS/CCh	8	5	150	15	30		35	70	Examination
Module 5. Cyber Security & Privacy										
Introduction to Information Technology	AS/CCh	3	5	150	15	30		35	70	Examination

Computer & Information Security	AS/CCh	3	5	150	15	30		35	70	Examination
Fundamentals of information security	AS/CCh	3	5	150	15	30		35	70	Examination
Introduction to cyber criminology	AS/CCh	4	5	150	15	30		35	70	Examination
Cryptography and Cyber Security	AS/CCh	4	5	150	15	30		35	70	Examination
Network security and cryptography	AS/CCh	4	5	150	15	30		35	70	Examination
Artificial Neural Networks	AS/CCh	5	5	150	15	30		35	70	Examination
Artificial Intelligence	AS/CCh	5	5	150	15	30		35	70	Examination
Artificial intelligence and expert systems	AS/CCh	5	5	150	15	30		35	70	Examination
Fraud and countermeasures in IT and telecommunications	BS/CCh	6	5	150	15	30		35	70	Examination
Basics of Cyber Forensic	BS/CCh	6	5	150	15	30		35	70	Examination
Digital Forensics and Investigations	BS/CCh	6	5	150	15	30		35	70	Examination
Decision Support Systems	AS/US	6	5	150	30	15		35	70	Examination
Ethical Hacking	AS/US	7	5	150	15	30		35	70	Examination
Module 6. Ubiquitous internet of things										
Computer communication and networking	BS/CCh	4	5	150	15	30		35	70	Examination
Network Infrastructure and Management	BS/CCh	4	5	150	15	30		35	70	Examination
Network Administration and Design	BS/CCh	4	5	150	15	30		35	70	Examination
Wireless Networks and Ubiquitous Computing	BS/CCh	5	5	150	15	30		35	70	Examination
Microwave communication	BS/CCh	5	5	150	15	30		35	70	Examination
Mobile communication system	BS/CCh	5	5	150	15	30		35	70	Examination
Linux Operating Systems & Networking	BS/US	6	5	150	15	30		35	70	Examination
Internship II	BS/US	6	5	150						Total mark on practice
IoT cloud infrastructure	AS/CCh	8	5	150	15	30		35	70	Examination
Internet of Things	AS/CCh	8	5	150	15	30		35	70	Examination
Performance and security in IoT	AS/CCh	8	5	150	15	30		35	70	Examination
Module 7. Mobile & web development										
Computer Architecture and Digital Systems	BS/CCh	3	5	150	15	30		35	70	Examination
Computer Organization and Assembly language	BS/CCh	3	5	150	15	30		35	70	Examination
Object-Oriented Programming with Java	BS/US	3	5	150	15	30		35	70	Examination
Digital logic fundamentals	BS/CCh	3	5	150	15	30		35	70	Examination
Interfaces of computer systems	BS/US	4	5	150	15	30		35	70	Examination
Web Applications Development	AS/US	5	5	150	15	30		35	70	Examination
User Experience Design	BS/US	6	5	150	15	30		35	70	Examination
Internet Application and Multimedia	AS/CCh	7	5	150	15	30		35	70	Examination

Subject	Code	Col3	Col4	Col5	Col6	Col7	Col8	Col9	Col10	Form
Mobile Computing	AS/CCh	7	5	150	15	30		35	70	Examination
Advanced Web Technolology	AS/CCh	7	5	150	15	30		35	70	Examination
Pre-diploma practice	AS/CCh	8	15	450						Total mark on practice
Internship III	AS/CCh	8	15	450						Total mark on practice
Android Application Development	AS/US	8	5	150	15	30		35	70	Examination
Final examination										
Comprehensive exam		8	8	240						
Diploma project		8	8	240						