

NSC “Kazakh National Research Technical University named after K. I. Satpayev”

**Institute of information and telecommunication technologies
Department «Electronics, telecommunications and space technologies»**

**Work curriculum
CURRICULUMPROGRAM**

**«TELECOMMUNICATION»
Master (master of engineering and technology)**

First edition
In accordance with the SES of higher education 2018

Almaty 2020

Разработано:	Рассмотрено: заседание УС Института	Утверждено: УМС КазННТУ	Страница 1 из 30
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Program drawn up and signed by the parties:

From KazNTU named after K. Satpayev:

1. Head of the Department "Electronics, telecommunications and space technology" (ETandST), Candidate of technical Sciences.....E.Tashtay
2. Director of the Institute of Information and Telecommunication Technologies (IandTT), PhD..... T. F. Umarov
3. Chairman of the teaching group of the Department, candidate of technical Sciences..... L. B. Iipbaeva
4. From employers - Director of the Institute of space technology and technology, doctor of technical Sciences.....D.Sh.Akhmetov

Approved at the meeting of the Educational and methodical Council of the Kazakh national research technical University named after K. I. Satpayev.
 Protocol №3 of 19.12.2018y.

Qualification

Level 7 of the National qualifications framework (master);
 7M062 telecommunication

Professional competence

1. Engineering telecommunication systems
2. Intelligent information and communication systems

Short description of the program:

Professional activities of graduates of the program cover the field of telecommunications, electronics, artificial intelligence and radio engineering.

The purpose of the educational program "Telecommunications" is to prepare highly qualified undergraduates on the basis of the integration of education and science of an effective system of training of engineers of the new formation, able to solve the problems of improving society and the development of new technologies in engineering telecommunications and intelligent infocommunication systems.

To this end, the student takes a course of theoretical training and exercises considerable relevance and practical significance. The results of the study are issued in the form of a master's thesis, the protection of which takes place in the prescribed manner.

In case of successful completion of the full course of master's degree, the graduate is awarded the academic degree "engineering and technology" in the field of engineering telecommunications and intellectual infocommunication.

The educational program of the master's degree "Telecommunications" differs from the existing educational program in the specialty 6M071900 – "radio engineering, electronics and telecommunications" by a complete update of the internal content of the disciplines. The bachelor's degree in OP "Telecommunications" provides for the acquisition of competencies in a wider field: electronics, telecommunications in order to ensure the adaptation of graduates of the bachelor's degree to the requirements of the labor market. The master's program provides for further deepening of the competencies acquired in the bachelor's degree.

The objectives of the educational program is:

- study of the cycle of General education disciplines to provide social and humanitarian education based on the laws of social and economic development of society, history, state language, Russian and foreign languages, modern information technologies;
- Study of the cycle of basic disciplines to obtain natural science, General technical and economic knowledge as the Foundation of professional education;
- study of the cycle of core disciplines for the formation of theoretical knowledge, practical skills and abilities to use for process control in systems of engineering telecommunications and infocommunication systems.
- acquisition of skills and abilities to perform technical calculations and substantiation of design decisions using modern computer technologies and intelligent programs.
- studying of disciplines forming knowledge, skills and abilities of planning and the organization of carrying out theoretical and laboratory researches.
- familiarization with technical processes, systems of organization, planning and management of production during the period of various practices.

Types of labor activity of graduates of the educational program are enterprises, complexes, institutions, educational organizations and other objects, which operate technological systems, technical means, providing any transmission, radiation and reception of signs, signals, written text, images, sounds, wire, radio, optical, as well as the transformation of information by electronic means or infocommunication communication systems.

The object of professional activity of the educational program is the field of science and technology, which includes a set of technologies, means, methods and methods of human activity aimed at creating conditions for the exchange of information at a distance, the transformation of information using electronic and radio means.

PASSPORT OF THE EDUCATIONAL PROGRAM

1 Scope and content of the program

The term of study in the master's degree is determined by the volume of mastered academic credits. When you master the set amount of academic credits and achieve the expected learning outcomes for a master's degree, the master's educational program is considered to be fully mastered. In profile magistracy 90 academic credits with a term of study of 1,5 years.

Planning the content of education, the method of organization and conduct of the educational process is carried out by the University and the scientific organization independently on the basis of credit technology of training.

The master's degree in the profile direction implements educational programs of postgraduate education for the preparation of managerial personnel with in-depth professional training.

The content of the educational program of the magistracy consists of:

- 1) theoretical training, including the study of cycles of basic and core disciplines;
- 2) practical training of undergraduates: various types of practices, scientific or professional internships;
- 3) experimental research work, including the implementation of the master's project – for the profile of the master's degree;
- 4) final certification.

The content of the educational program (OP) "Telecommunications" is implemented in accordance with the credit technology of education and is carried out in the state, Russian languages.

Objectives of the educational program:

The objectives of the educational program is:

- study of the cycle of General education disciplines to provide social and humanitarian education based on the laws of social and economic development of society, history, state language, Russian and foreign languages, modern information technologies;
- Study of the cycle of basic disciplines to obtain natural science, General technical and economic knowledge as the Foundation of professional education.
- Study of a cycle of profile disciplines for formation of theoretical knowledge, practical skills and abilities in use for management and development of processes in systems of communication, electronics and radio engineering.
- Acquisition of skills and abilities to perform technological calculations and substantiation of design decisions using modern computer technologies and intelligent programs.
- studying of disciplines forming knowledge, skills and abilities of planning and the organization of carrying out theoretical and laboratory researches.
- the introduction of technological processes,

2 Requirements for applicants

The previous level of education of applicants is higher professional education (bachelor's degree). The applicant must have a diploma of the established sample and confirm the level of knowledge of the English language with a certificate or diplomas of the established sample.

The procedure for admission of citizens to the magistracy established in accordance with the "Standard rules of admission to education in educational organizations that implement educational programs of postgraduate education".

The formation of a contingent of undergraduates is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as payment for training at the expense of citizens ' own funds and other sources. Citizens of the Republic of Kazakhstan the state provides the right to receive on a competitive basis in accordance with the state educational order free postgraduate education, if they receive education at this level for the first time.

At the «entrance» the undergraduate must

In the absence of the necessary prerequisites, the undergraduate is allowed to master them on a paid basis.

3 Requirements for completion of studies and obtaining a diploma

Degree/qualifications awarded: The graduate of this educational program is awarded the academic degree "engineering and technology" in the field of engineering telecommunications and intellectual info communication.

A graduate who has mastered the master's program must have the following General professional competencies:

- the ability to independently acquire, comprehend, structure and use in professional activities new knowledge and skills, to develop their innovative abilities;
- ability to independently formulate research goals, establish a sequence of professional tasks;
- ability to apply in practice knowledge of fundamental and applied sections of disciplines that determine the direction (profile) of the master's program;
- ability to professionally choose and creatively use modern scientific and technical equipment to solve scientific and practical problems;
- the ability to critically analyze, represent, defend, discuss and disseminate the results of their professional activities;
- possession of skills of drawing up and registration of scientific and technical documentation, scientific reports, reviews, reports and articles;
- willingness to lead the team in the field of their professional activities, tolerant of social, ethnic, religious and cultural differences;
- readiness for communication in oral and written forms in a foreign language to solve the problems of professional activity.

A graduate who has mastered the master's program must have professional competencies corresponding to the types of professional activities that the master's program is focused on:

- *production activity:*
 - ability to independently carry out production, field and laboratory and interpretation work in solving practical problems;
 - ability to professional operation of modern field and laboratory equipment and devices in the field of master's program;
 - ability to use modern methods of processing and interpretation of complex information to solve production problems;
- *project activity:*
 - ability to independently prepare and submit projects of research and scientific-production works;
 - willingness to design a comprehensive research and scientific-production work in solving professional problems;
- *organizational and managerial activities:*
 - readiness to use practical skills of organization and management of research and scientific-production works in solving professional problems;

- readiness for practical use of normative documents in planning and organization of scientific and production works;

When developing the master's program, all General cultural and professional competencies, as well as professional competencies related to the types of professional activities that the master's program is focused on, are included in the set of required results of the master's program.

4 Working curriculum of the educational program

4.1. Term of training 1,5 years

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
 Non-profit Joint Stock Company "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after S. SATBAYEV"
 Satbayev University

Approved by:
 Resolution No. 0001 Joint Stock Company "KazNRTU named after S. Satbayev"
 Beysenbetov I.K.
 2020 y.

WORKING CURRICULUM of the educational program for registration for the 2020-2021 academic year
 Education program "TMS - Information and communication systems"
 Group of Educational Programs "WORK-Contributions and competencies in research area"

Academic degree: Magister
 Term of study: 1,5 years

Year of study	Code	Name of course	Component	Academic credits	Lecture/lab/practicum	Prerequisites	Code	Name of course	Component	Academic credits	Lecture/lab/practicum	Prerequisites
1	LNQ200	Foreign language (professional)	BD IC	6	0/0/3		ELC214	Digital Signal Processing Technology	RU OC	4	1/0/1	ELC110, ELC149
	MNE274	Management	BD IC	6	2/0/1		ELC250	Programming the microcontroller	PS OC	6	2/1/0	ELC171
	HLW004	Management Psychology	BD OC	4	1/0/1		ELC254	Wireless Sensory Networks	PS OC	6	2/0/1	
	ELC120	Heterogeneous networks and services	BD OC	6	2/0/1	ELC128, ELC148	ELC221	Multichannel RTS information transfer	PS OC	6	2/0/1	ELC142
	ELC060	Technology Internet of things	PS OC	6	2/0/1		ELC251	Methods of modeling and optimization in telecommunication systems and networks	PS OC	6	2/0/1	ELC110, ELC149
	ELC192	Modern Sensor Technologies and Applications	PS OC	6	2/0/1	ELC110, ELC195, ELC128	AAP221	Master's student experimental research work, including internship and master's project implementation	MSEW	4		
	in total				34		in total				32	
2	AAP220	Master's student experimental research work, including internship and master's project implementation	MSEW	14								
	AAP245	Work placement	PS	6								
	ECA205	Registration and defense of the master's thesis	FA	12								
	in total				32		in total				32	
in all				101		in all				101		

Number of credits for the whole period of study

Cycles of disciplines	Credits
The cycle of general education	
A cycle of basic disciplines (BD IC, BD OC)	26
A cycle of principal subjects (PS IC, PS OC)	45
All on the theoretical classes:	71
MSEW	14
Registration and defense of the master's thesis	12
In total	101

Decision of the Academic Board of Satbayev University: Protocol No. 3 of 15.09.2020

Decision of the Academic Board of the Institute: Protocol No. 5 of 23.12.2019

Vice-Rector for Research and Academic Affairs: [Signature] D.K. Naurybayeva

Chair of the ACC: [Signature] S.B. Tulgimova

Director of the Institute: [Signature] Omarbekov B.O.

Head of the Department: [Signature] Syrgabaev I.

MODULAR EDUCATIONAL PROGRAM

Specialty: 7M06202 Telecommunications

Form of study: *daytime* Duration of study: *1,5 y.* Academic degree: *Master of Engineering and Technology*

Cycle of discipline	discipline code	Name of disciplines	Semester	Number of credits PK EC TS	lec	lab	prac	IWS	Form of control ex	Department
Profile training module										
Basic disciplines (DB) (26-credits)										
University component (VC)										
BD 1.2.1	LNG209	English language (professional)	1	6	0	0	3	3	Exam	EL
BD 1.2.2	MNG274	Management	1	6	2	0	1	3	Exam	SEPMC
BD 1.2.3	HUM204	Psychology of management	1	4	1	0	1	2	Exam	SEPMC
Component of choice (CC)										
BD 1.2.3	ELC223	Heterogeneous networks and services	1	6	2	0	1	3	Exam	ET&ST
BD 1.2.3.1	ELC261	Fundamentals of Software Defined Radio	1	6	2	0	1	3	Exam	ET&ST
BD 1.3.3.1	ELC214	Digital Signal Processing Technology	2	4	1	0	1	2	Exam	ET&ST
BD 1.4.1	ELC215	Telemetry infocommunication systems	2	4	1	0	1	2	Exam	ET&ST
Module theoretical processing and design of telecommunication systems										
Major disciplines (MD) (45-credits)										
University component (UK)										
Optional component (OC)										
PD 1.3.1	ELC260	Technology Internet of things	1	6	2	0	1	3	Exam	ET&ST
PD 1.3.1.1	ELC205	Broadband wireless networks	1	6	2	0	1	3	Exam	ET&ST
PD 1.3.2	ELC262	Modern Sensor Technologies and Applications	2	6	1	1	1	3	Exam	ET&ST
PD 1.3.2.1	ELC263	The current state of intelligent networks and communication systems	2	6	1	1	1	3	Exam	ET&ST
PD 1.3.3	ELC256	Programming the microcontroller	2	6	2	1	0	3	Exam	ET&ST
PD 1.3.3.1	ELC257	Microcontroller devices in REI	2	6	2	1	0	3	Exam	ET&ST
PD 1.3.4	ELC254	Wireless Sensory Networks	3	6	2	0	1	3	Exam	ET&ST
PD 1.3.4.1	ELC255	Technology and architecture of mobile networks	3	6	2	0	1	3	Exam	ET&ST
PD 1.3.5	ELC221	Multichannel RTS information transfer	3	6	2	0	1	3	Exam	ET&ST
PD 1.3.5.1	ELC222	Электромагнитная совмести-мость радио-электронных средств	3	6	2	0	1	3	Exam	ET&ST
PD 1.3.6	ELC251	Methods of modeling and optimization in infocommunication systems and networks	3	6	2	0	1	3	Exam	ET&ST
PD 1.3.6.1	ELC251	Methods of modeling and optimization in infocommunication systems and networks	3	6	2	0	1	3	Exam	ET&ST
Practice-oriented module (9-credits)										
PD	AAP246	Work placement	3	9					Report	ET&ST
Research module (18-credits)										



MSERW	AAP221	Master's student experimental research work, including internship and master's project implementation	1	4					Report	ET&ST
MSERW	AAP220	Master's student experimental research work, including internship and master's project implementation	2	14					Report	ET&ST
Final certification module(12-credits)										
FA	ECA206	Registration and defense of the master's thesis	3	12					Defense of dissertations	ET&ST
Total credits				101						

5 Descriptors of the level and scope of knowledge, skills and competencies

The requirements for the level of preparation of the master's degree are determined the basis of Dublin descriptors of the second level of higher education (master's degree) and reflect the mastered competences expressed in the achieved results of training.

The results of training formulated at the level of the entire educational program of the master's degree, as well as at the level of individual modules or disciplines.

Descriptors reflect learning outcomes that characterize the learner's abilities:

1) demonstrate developing knowledge and understanding in the field of engineering telecommunications, also based on advanced knowledge of this field and intellectual infocommunication, in the development and (or) application of ideas in the context of the study;

2) Apply at a professional level their knowledge, understanding and abilities to solve problems in a new environment, in a wider interdisciplinary context;

3) Collect and interpret information to form judgments based on social, ethical and scientific considerations;

4) Clearly and unambiguously communicate information, ideas, conclusions, problems and solutions to both professionals and non-specialists;

5) Training skills necessary for independent continuation of further training in the studied field of engineering telecommunications and intellectual info communication.

6 Competencies at the end of training

6.1 Requirements to key competences of graduates of profile magistracy, should:

1) *Know:*

- on current trends in the development of scientific knowledge;
- About actual methodological and philosophical problems of natural (social, humanitarian, economic) Sciences;

- Contradictions and socio-economic consequences of globalization processes;

- On the current state of the economic, political, legal, cultural and technological environment of the world business partnership;

- - on the organization of strategic enterprise management, innovation management, leadership theory;

- About the main financial and economic problems of functioning of the enterprises.

2) *know:*

- methodology of scientific knowledge;

- the main drivers of changes in the structure of the economy;

- features and rules of investment cooperation;

- At least one foreign language at the professional level, allowing to conduct scientific research and practical activities.

3) *Could:*

- apply scientific methods of knowledge in professional activities;
- Critically analyze existing concepts, theories and approaches to the study of processes and phenomena;
- integrate knowledge gained in different disciplines, use them to solve analytical and management problems in new unfamiliar conditions;
- To carry out microeconomic analysis of economic activity of the enterprise and to use its results in enterprise management;
- To apply in practice new approaches to the organization of marketing and management;
- To make decisions in complex and non-standard situations in the field of organization and management of economic activity of the enterprise (firm);
- To apply in practice the norms of the legislation of the Republic of Kazakhstan in the field of regulation of economic relations;
- To think creatively and creatively to solve new problems and situations;
- To carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;
- To summarize the results of experimental research and analytical work in the form of a master's thesis, article, report, analytical note, etc.

4) *Have the skills:*

- Solutions of standard scientific and professional tasks;
- Scientific analysis and solutions of practical problems in the organization and management of economic activities of organizations and enterprises;
- research problems in the field of management and marketing and use the results to improve the methods of enterprise management;
- Professional communication and intercultural communication;
- Oratory, correct and logical design of their thoughts in oral and written form;
- Expansion and deepening of knowledge necessary for daily professional activity and continuation of education in doctoral studies;
- Use of information and computer technologies in the sphere of professional activity.

5) *To be competent:*

- In the field of research methodology in the specialty;
- In the field of modern problems of the world economy and participation of national economies in world economic processes;
- In the organization and management of the enterprise;
- In the implementation of industrial relations with various organizations, including public service;
- In ways to ensure constant updating of knowledge, expansion of professional skills and abilities.

B – Basic knowledge and skills

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B-basic knowledge and skills:

- B 1-capable of philosophical analysis of social phenomena, personality behavior and other phenomena. Ready to conduct a philosophical assessment of social phenomena;
- B 2-know and apply in practice the basics of engineering professional ethics;
- B 3-to be able to analyze actual problems of modern history of Kazakhstan.

P-Professional competence:

- P1-a wide range of theoretical and practical knowledge in the professional field;
- P2-able to analyze electrical and wiring diagrams of radio systems, electronics or infocommunication communication systems.
- P3-is ready to make installation, adjustment and operation of systems of electronics, radio engineering and infocommunication;
- P4-ready to participate in the development and design of new systems of electronics, radio and infocommunication.
- P5-knows the regulatory and technological documentation of communication systems, electronics standards requirements for infocommunication, electronic and radio systems and devices.
- P6-able to configure telecommunications, electronic and radio equipment;
- P7-ability to apply independently scientific and technical solutions in the field of engineering telecommunications and intelligent Infocommunications.
- P8-provide technical support to users of infocommunication systems.

U - Universal, social and ethical competences

- O1-able to use English, Kazakh (Russian) languages as a means of business and professional communication, a source of new knowledge in the field of engineering telecommunications or infocommunication;
- O2-know and apply in work and life the basics of applied ethics and ethics of business communication;
- O3-know and apply the basic concepts of professional ethics;

S – Special and managerial competencies:

- S1-independent management and control of the processes of labor and educational activities within the framework of the strategy, policy and goals of the organization, discussion of problems, reasoning of conclusions and competent handling of information;
- S2 – to be an expert on experimental studies of electronic and radio engineering or information and communication communication systems;
- S3-to be a researcher on research and synthesis of modern systems of radio engineering and electronics or infocommunication communication systems;
- S3-to be an engineer for the development and design of electronic, radio or infocommunication communication systems.

6.2 Requirements for experimental research work of a master student in a specialized master's degree:

- 1) corresponds to the profile of the educational program of the magistracy, on which the master's project is carried out and protected;
- 2) it is based on modern achievements of science, technology and production and contains specific practical recommendations, independent decisions of management tasks;
- 3) is performed with the use of advanced information technologies;
- 4) contains experimental research (methodological, practical) sections on the main protected provisions.

6.3 Requirements for the organization of practices:

The educational program of the profile magistracy includes industrial practice in the cycle of PD.

Manufacturing practices in a cycle of PD is carried out to consolidate the theoretical knowledge gained in the process of learning, acquisition of practical skills, competences and professional experience on trained graduate scholarship programs, development of best practices.

7 Supplement to the diploma according to the standard ICES

The application is developed by the post-standards of the European Commission, Council of Europe and UNESCO / CEPES. This document serves only for academic recognition and is not an official confirmation of the document on education. Without a diploma of higher education is not valid. The purpose of filling out the European Application is to provide sufficient data on the holder of the diploma, the qualification obtained, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information on the national education system. The application model on which the estimates will be translated uses the European transfer or credit transfer system (ECTS).

The European diploma Supplement provides an opportunity to continue education in foreign universities, as well as to confirm the national higher education for foreign employers. When traveling abroad for professional recognition will require additional legalization of the diploma of education. The European diploma Supplement is completed in English on an individual request and is issued free of charge.

Foreign language (professional) **Professional English for Project Managers**

CODE – LNG201
CREDIT – 3 (0/0/3)

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PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to develop students ' knowledge of the English language for ongoing academic research and to increase the effectiveness of work in the field of project management.

BRIEF DESCRIPTION OF THE COURSE

The course is aimed at the formation of vocabulary and grammar for effective communication in the field of project management and the improvement of reading, writing, listening and speaking at the "Intermediate" level. It is expected that students will acquire to replenish their vocabulary of business English and learn the grammatical structures that are used in the context of management. The course consists of 6 modules. The 3rd module of the course is completed by an intermediate test, and the 6th module is followed by a test at the end of the course. The course ends with a final exam. Undergraduates also need to study independently (MIS). MIS-independent work of undergraduates under the guidance of a teacher.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Upon successful completion of the course, students are expected to be able to recognize the main idea and main message, as well as specific details when listening to monologues, dialogues and group discussions in the context of business and management; understand written and spoken English on topics related to management; write management texts (reports, letters, emails, minutes of meetings), following the generally accepted structure with a higher degree of grammatical accuracy and using business words and phrases, talk about different business situations, using the appropriate business vocabulary and grammatical structures - in pair and group discussions, meetings and negotiations.

Project management (Management + management Psychology)

CODE HUM201

CREDIT 2 (1/0/2)

PREREQUISITES: HUM124

The discipline "Project management" is based on the knowledge gained as a result of studying disciplines in undergraduate courses

PURPOSE AND OBJECTIVES OF THE COURSE The purpose of teaching the discipline "Project management" is the development of project management methodology in various fields of activity, education of culture, adequate to modern project management and information technology, creating conditions for the introduction of new information technologies in the field of projects. The course is based on international recommendations on project management (Project Management Body of Knowledge).

BRIEF DESCRIPTION OF THE COURSE The content of the discipline is aimed at the study of modern concepts, methods, tools of project management in order to apply them in the further practical activities of the specialist to solve the problems of planning and execution of projects.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Could:

- prepare documents of the project initialization stage, such as feasibility study, project Charter, etc.
- develop and analyze documents related to the planning of project activities, apply various methods to support the decision-making;
- monitoring the performance of the works and to monitor the deadlines;
- to select shots, to resolve contradictions between team members;
- manage risks arising in the implementation of projects.

Knowledge gained during the course of the discipline:

- Modern standards in the field of project management and their characteristics;
- Project management approach;
- Planning of investment activity;
- Consideration of project risks;
- Methods to optimize the use of available resources;
- Methods of conflict resolution;
- Analysis of actual indicators for timely adjustment of the progress of work.

Skills:

- project management in accordance with modern requirements of project management-apply in the process of project management software MS Project

Digital signal processing technology

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CODE – ELC214

CREDIT – 3 (1/1/1)

PREREQUISITES – ELC110 ,ELC149

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the discipline is to form clear ideas about the fundamental provisions of the theory of digital signal processing technology.

- teaching the basics of analytical and numerical methods of calculation and analysis of digital converters of measuring signals;
- development of skills of design of digital measuring converters, processing of experimental results and their analysis.

Discipline objectives

- creation of optimal conditions for teaching the discipline taking into account the level of training of students in mathematics, physics and electronics.

BRIEF DESCRIPTION OF THE COURSE

Basic concepts of physical magnitude, measurement and signal conversion. Signal classification: deterministic and random signals, continuous, discrete and quantized signals.

Types of deterministic signals, their parameters. Single pulse, constant signal, harmonic and polyharmonic signals. Decomposition of a periodic signal into a Fourier series. Signal spectrum.

Non-periodic (transient) signals. Fourier transform for transient signals.

Analog system. Pulse and transient characteristics. Gain.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of studying the discipline should know and be able to:

- basic methods of mathematical description of signals and digital measurement transformations;
- the most important properties and characteristics of digital transducers;
- principles of hardware implementation of digital signal processing systems;
- methods of calculation of digital transducers.

Current state of engineering telecommunications and intelligent systems

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CODE– ELC

КРЕДИТ – 3 (1/0/1)

PREREQUISITES – ELC179 ,ELC128, ELC120

PURPOSE AND OBJECTIVES OF THE COURSE

is the training of qualified professionals with knowledge and skills in the application of knowledge engineering and Neuroinformatics to solve problems of communication systems.

BRIEF DESCRIPTION OF THE COURSE

The course allows you to develop an adequate understanding of the advanced scientific achievements of the last decade. Discipline "Current state of telecommunications engineering and intelligent systems" studies the structure and principles of intelligent telecommunication systems also knowledge engineering, is the study of intellectualization systems engineering telecommunications decision support systems.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

after studying this discipline the student must:

- know the basic concepts of knowledge engineering
- know the basics of building expert systems, intelligent telecommunication systems and decision support systems
- know the technology of adaptation of intelligent telecommunication communication systems
- able to work with information from various sources to use the appropriate mathematical apparatus and tools for processing, analysis and systematization of information on the topic of research

Noise-resistant digital information transmission systems

CODE – ELC207

CREDIT – 3 (2/0/1)

PREREQUISITES – ELC110 ,ELC149

PURPOSE AND OBJECTIVES OF THE COURSE

Studying the discipline "noise-Resistant systems of digital information transmission" to determine the latest scientific achievements in technology and devices to improve the noise immunity of transmitted messages.

BRIEF DESCRIPTION OF THE COURSE

key processes pre-processing of digital information; interference and their effect on a digital signal methods to improve the noise immunity of digital communication, the classification of parameters noise immunity, the model channels noise-immune information transmission, providing noise-immune modulation, the classical methods of creation and implementation of encoders and decoders for error-correcting codes modern methods and device coding.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

know:

- methods of classical coding and decoding of noise-resistant codes;
- estimation of boundaries of parameters of noise-resistant codes.

Know

- to illustrate with appropriate examples of construction of functional schemes of encoders and decoders of classical noise-resistant codes;
- to build the functional diagram of the encoders of modern error-correcting codes.

own

- skills to improve noise-resistant coding in digital communication systems.

Broadband wireless network

CODE – ELC

CREDIT – 3 (2/0/1)

PREREQUISITE – ELC132

PURPOSE AND OBJECTIVES OF THE COURSE

the purpose of the discipline is the study and practical development of the basics of building and using wireless networks and systems based on them.

BRIEF DESCRIPTION OF THE COURSE

classification and characteristics of wireless networks. Access methods in local Wi-Fi wireless networks. Time, frequency, code, spatial methods of access separation in IEEE 802.11 networks. MAC-level of the IEEE 802.11 standard. Organization of physical and channel levels. The spread spectrum technology and methods of modulation of the radio signal. The spread spectrum technology DSSS. Methods of generating information symbols. Modulation BPSK, QPSK. Ways to expand the spectrum of signals. Barker Code. Ways to convert data into a modulation symbol. Modulation methods OBPSK, OQPSK, DBPSK, DQPSK. QAM modulation, data representation on a signal constellation. CCK is a method of encoding and protecting information. Walsh codes and Hadamard matrix. Orthogonal codes. PBCC is a method of encoding and protecting information. Construction of dotted and convolutional encoders. OFDM modulation based on Fourier transforms. Forward and reverse Fourier transform for transmitting / receiving information symbols. Ultra-wideband pulse networks. Method of generation and transmission / reception of information symbols based on broadband pulse coding. Ultra-fast wireless networks. 802.11 Wi-Fi networks.xx. Architecture, protocols, characteristics of Wi-Fi networks of 802.11 b, s, xxx standards.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

to know the architecture, specifications, methods of construction and application of wireless networks standards, IEEE 802.11 b, 802.11 a, 802.11 g, 802.16; access methods in wireless networks; General methods of generation of information technologies; spread spectrum; coding methods, modulation, conversion information. To be able to use methods of construction and application of wireless networks for creation of local networks of Wi-Fi; to use specifications of the IEEE 802.16 WiMAX broadband standard at deployment and operation of city and regional systems. Master standard terminology and methods for designing and modeling broadband wireless networks for commercial and General purpose applications.

Methods of modeling and optimization in information and communication systems and networks

CODE – ELC220

CREDIT – 3 (2/0/1)

PREREQUISITES – ELC110 ,ELC149

PURPOSE AND OBJECTIVES OF THE COURSE

To consider the basic concepts and definitions of modeling theory, including the model, the system. The classification of models and the main stages of modeling will also be considered.

Discipline objectives

The main task of the theory of modeling is to equip researchers with the technology of creating such models that accurately and fully capture the properties of the originals, easier or faster amenable to research and allow the transfer of its results to the originals.

BRIEF DESCRIPTION OF THE COURSE

Object models are divided into two large classes: material (physical) and abstract (mathematical). Among physical models, analog models are the most common. With the development of mathematics, mathematical models were widely used. In essence, all mathematics is designed for the compilation and study of models of objects or processes.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of studying the discipline should know:

- to know the formalized description of structure and process of functioning of system for unambiguity of their understanding;
- try to present the process of functioning in a form that allows analytical study of the system.

As a result of studying the discipline should be able to:

- assess the capacity of the network and its components;
- identify "bottlenecks" in the structure of the computer system;
- compare different variants of the organization of the computer system;
- to carry out the perspective forecast of development of computer system;
- predict future network bandwidth requirements using forecast data;
- estimate the required number and performance of servers in the network;
- to compare the various options of modernization of the computer system;

Microcontroller programming

CODE – ELC256

CREDIT – 3 (2/1/0)

PREREQUISITES – ELC171

PURPOSE AND OBJECTIVES OF THE COURSE

preparation of the master student for independent use of microcontrollers for management and regulation of telecommunication systems

The objectives of the discipline are:

- types of processor architectures;
- types of modern ways to configure the microcontroller;
- types of communication protocols;
- methods and methods of building microcontroller systems;
- language of configuration of programmable logic circuits at the basic level.
- ability to develop a command system for microcontrollers;
- skills of work with means of debugging and programming of microcontrollers.

BRIEF DESCRIPTION OF THE COURSE

Classification of microcontrollers used in telecommunication systems, the structure of the microcontroller, the organization of interrupting the microcontroller, study, external devices of the microcontroller, features of operation and study of the programming environment of microcontroller systems.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

- be able to classify microcontroller systems;
 - be able to use microcontrollers in the design of telecommunication systems.
- Know the programming environment for the design and management of communication systems.

Optical communication system components

CODE – ELC219

CREDIT – 3 (2/0/1)

PREREQUISITE – ELC110 ,ELC149

PURPOSE AND OBJECTIVES OF THE COURSE

teaching students the choice of optical communication system, principles and methods of signal transmission via fiber optic cables, scientific foundations and the current state of the fiber optic communication system. It deepens and develops the training of communication engineers, mastering modern technology of construction and transmission of digital information. Obtaining knowledge skills in the transmission of optical signals via optical cables

BRIEF DESCRIPTION OF THE COURSE

The course covers the following main sections of optical systems:

- transmission of light signal by optical fiber.
- - application of fiber optic amplifiers.
- to organize a fiber-optic communication line.
- laying fiber optic.
- installation of optical cables.
- planning of the route and laying of FOCL.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

In the process of training, doctoral students should have a clear idea of the main directions and prospects for the development of communication systems and technology, know the organization of telecommunications enterprises, the main parameters and requirements of the fiber-optic communication line.

Know: the organization of telecommunications enterprises, the basic parameters and requirements of fiber-optic communication line.

To possess: to design fiber-optic communication line.

Multi-channel RTS information transfer

CODE – ELC221

CREDIT – 3 (2/0/1)

PREREQUISITE – ELC131

PURPOSE AND OBJECTIVES OF THE COURSE

The aim of the course is to familiarize the students the principles of construction of radio transmitters and forming of signals, principles of radio receivers and radio signal processing, qualitative characteristics of channels and circuits of communication, the principles of modern communication systems. And also, the study of the basics of the theory and methods of construction of the main types of multi-channel RTS, the study of the composition and principles of the RTS.

BRIEF DESCRIPTION OF THE COURSE

The course covers the following main sections: Principles of radio communication. Classification of radio wave bands. Elements of the theory of propagation of radio waves. Features of electromagnetic waves propagation. Different range. Features of radio communication system. Radio transmission of continuous messages. Differential entropy of a continuous signal. The bandwidth of the communication channel in the transmission of continuous signals. Characteristics of communication channels and paths.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

know the methods of electronic modeling;

- achievements of science and technology at home and abroad in the development and production of electronic equipment;
- methods of analysis and synthesis of communication networks.

Know:

- basic principles of information transmission systems of radar systems, radio navigation systems;
- basic principles of work;
- basic relations of the theory of radio engineering systems design;

Own:

- to apply methods of optimal solutions theory in designing Radiosystems of information transfer, radiolocating systems;
- to collect and analyze scientific and technical information, to summarize domestic and foreign experience in the field of radio engineering;
- to carry out preparation of scientific researches and technical developments

Satellite communication and navigation systems

CODE – ELC212

CREDIT – 3 (2/0/1)

PREREQUISITE – ELC1702

PURPOSE AND OBJECTIVES OF THE COURSE

to study types of orbits and parameters of satellite systems, architecture and principles of operation of satellite communication systems, navigation satellite systems, features of equipment for satellite communication. Parameters of signals and channels, radio relay communication lines, digital radio communication systems, auxiliary systems. The study of the discipline contributes to the successful preparation for professional development of a specialist.

BRIEF DESCRIPTION OF THE COURSE

communication system: the service area, the bandwidth, the parameters of the orbits and number of satellites. Space stations (CS) and ground stations (NS), modulation methods, quality of organized channels. Characteristics of satellite communication stations: operating frequency range equivalent isotropic radiated power (eirp), the number of trunks and their bandwidth, relay method with or without signal processing. Transmission of TV signals in analog form using frequency modulation (FM) and in digital form via satellite channels. Features of construction of satellite navigation systems, coordination of satellite navigation systems "GLONASS" and "NAVSTAR" - GPS.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

- know the technical concepts of building satellite systems, the main parameters of radio channels and methods for determining these parameters; the main methods of calculating the energy parameters of systems and technical parameters of networks; purpose and functional schemes of information systems, methods of multi-station access and their applications; technical parameters of standards of satellite systems.
- to have an idea about trends in the development of technologies of information satellite systems, about the laws that determine the relationship between the quality indicators of channels, energy parameters of the system, indicators of effective use of frequency bands and power, economic indicators of systems

The educational program of the magistracy includes industrial practice:

CODE – AAP

CREDIT –6

The master's practical training is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, with modern methods of research, processing and interpretation of experimental data.

Experimental research work of the undergraduate

CODE – AAP227

CREDIT –8

Experimental research work of the master's degree should:

- to correspond to the main problems of the specialty on which the master's thesis is defended;
- to be actual, to contain scientific novelty and practical significance;
- based on modern theoretical, methodological and technological achievements of science and practice;
- be carried out using modern methods of scientific research;
- contain research (methodological, practical) sections on the main protected provisions;
- based on international best practices in the relevant field of knowledge.
- carried out with the use of advanced information technology;
- contain experimental research (methodological, practical) sections on the main protected provisions.

Registration and protection of the master's project

CODE – ECA501

CREDIT –7

The purpose of the master's thesis/project is:
demonstration of the level of scientific/research qualification of the undergraduate, the ability to independently conduct a scientific search, checking the ability to solve specific scientific and practical problems, knowledge of the most common methods and techniques for solving them.

BRIEF DESCRIPTION

Master's thesis/project graduate qualification scientific work, which is a generalization of the results of independent studies undergraduates one of the pressing problems of a particular specialty relevant branch of science that has internal unity and reflects the progress and results of the development of the chosen topic.

Master's thesis / project-the result of research/experimental research work of the undergraduate, conducted during the entire period of study of the undergraduate.

The defense of the master's thesis is the final stage of master's training. The master's thesis / project must meet the following requirements:

- the work should conduct research or solve current problems in the field of engineering telecommunications and intellectual infocommunication;
- the work should be based on the identification of important scientific problems and their solution;
- decisions should be scientifically grounded and reliable, have internal unity;
- dissertation work / project must be written individually.

Content

- 1 Scope and content of the program
- 2 requirements for applicants
- 3 Requirements for completion of studies and obtaining a diploma
- 5 working curriculum of the educational program
- 5 Descriptors of the level and scope of knowledge, skills and competencies
- 6 Competence at the end of training
- 7 Annex to the certificate according to the standard ETS

