

**Institute of Industrial Automation and Digitalization
named after A. Burkitbaev**

Department of "Electronics, telecommunications and space technology"

CURRICULUM PROGRAM


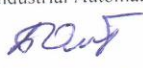
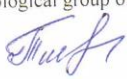

6B06201 -«TELECOMMUNICATION»

**Bachelor in Information and Communication Technology
in the direction of 6B062 Telecommunications**

Group of Educational programs
B059 - "Communications and communications technology"

Almaty 2020

The program was drawn up and signed by the parties:
from Satbayev University:

1. Head of the department "Electronics, telecommunications and space technology"
 I. Syrgabaev
 2. Director of the A. Burkitbaev Institute of Industrial Automation and Digitalization
 B.O. Omarbekov
 3. Chairman of the educational and methodological group of the department,
candidate of technical sciences
 E. Tashtay
- From employers
- Director of «World Telecom»  D.R. Musakhanov

Approved at the meeting of Educational and Methodological Board of Satpayev
University (Minutes # 4, 14.01.2020)

Qualification:

Level 6 of the National Qualifications Framework:
B059 - " Communications and communication technology "
6B062 Telecommunications (bachelor)

Professional competence: providing deep theoretical knowledge and practical skills
in the field of radio electronics and telecommunications

| | | | |
|--------------|--|-------------------------|------------------|
| Разработано: | Рассмотрено: заседание УС Института | Утверждено: УМС КазННТУ | Страница 2 из 53 |
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1 Brief program description

Professional activity of graduates of the program is directed to the area of radio engineering, electronics, digital communication systems, intellectual telecommunication technologies, the systems of broadcasting and television.

Training of specialists on radio engineering, electronics and telecommunication will be carried out according to the new educational program (EP) of "Telecommunication" in which there are two specializations: "Infocommunication technologies and communication systems", "Systems of broadcasting and television".

Content of disciplines of the educational program was developed taking into account the appropriate educational programs of leading universities of the world and the international qualifier of professional activity for the direction telecommunication.

Types of professional activity are: production and technological; service and operational; organizational and administrative; assembly and adjustment; settlement and design; experimental and research.

Objects of professional activity are the systems including: development and operation of telecommunications systems, radio communications, television, broadcasting, a radar-location and navigation, radio control, mobile communication, satellite communication, a broadcast and radio reception of the TV and sound signals, electronic and computer systems and systems operated by means of microcontrollers and and the micro COMPUTER.

The purpose of the educational program (EP) – training of highly qualified specialists in the field of the radio electronics and telecommunications having the profound knowledge, abilities and practical skills providing high-quality performance of the functional obligations for the chosen specialty, mobility in the market of professional work knowing the last world achievements and the prospects of development of the industry.

Task of the educational program is:

- training of new competitive generation of technical specialists in the field of radio engineering, electronics and telecommunications for labor market, initiative, able to work in team, having high personal and professional competences;
- integration of educational and scientific activity;
- establishment of partnership with the leading higher education institutions of the FSU and beyond for the purpose of improvement of quality of education, for support technical and cultural ties;
- extension of contacts with customers of educational services, employers for the purpose of definition of requirements to quality of training of specialists, to carrying out courses, seminars, master classes, training, work practice.

The contents of the educational program (EP) "Telecommunication" (earlier 5B071900 – "The radio technician, the electronic engineer and telecommunication") are implemented according to credit technology of training and are carried out in the

state, Russian and English languages.

EP allows to realize the principles of Bologna Process successfully. On the basis of the choice and independent planning by students of the sequence of studying of disciplines, they independently create the individual curriculum (IC) on each semester with the help

edvayzer on the basis of the educational program and the directory of elective disciplines.

In the educational program the volume of mathematical, natural-science, basic and language disciplines is increased.

Such disciplines as are studied: "Bases of radio engineering and telecommunications", "Physical fundamentals of electronics", "Circuitry of electronic means", "Technology of digital communication", "Microprocessor and microcontroller devices and systems", "Technology of wireless communication", "Radio transmitters and receivers devices", "Antenna-feeder devices and radio wave propagation", "Systems of satellite communication", "Network technologies", "Digital systems of TV and radiobroadcasting", "Fiber-optical systems in telecommunications", etc. Special attention is paid to digital broadband technologies of communication. New profile disciplines which consider the latest trends in the field of telecommunications, such as are added: "Intellectual networks", "Geographic information systems in telecommunications".

Students do practical training in such companies as JSC Kazakhtelecom, JSC Transtelecom, JSC ALTEL, JSC KazTransCom, Kar-Tel LLP, JSC Kazteleradio of JSC Kazpochta, etc. and also at telephone exchanges of large enterprises.

According to the program of the academic mobility the best students will be is trained at the leading foreign universities on the corresponding EP.

Graduates in the direction ""Telecommunications" work as operators, specialists in electronics, operators, managers on the organization of business processes of telecommunication

2 Entry Requirements

Reception of the persons arriving on the educational program "Telecommunication" is carried out according to statements of the entrant who completed in full an average, a secondary special education on a competitive basis according to points of the certificate issued by results of uniform national testing at the minimum assessment not less than 65 points.

Special requirements to revenues to the program are applied to graduates of 12 summer schools, colleges, programs of an applied bachelor degree, NICHES, etc. Such entrants should pass diagnostic test on English, mathematics, physics and special disciplines.

Rules of reoffset of the credits for the accelerated (reduced) training at base of 12-year secondary, secondary technical and higher education

| Code | Type of competence | Competency description | Result of competence | Responsible |
|--|------------------------------------|--|--|---|
| GENERAL | | | | |
| (Implies full studying with possible additional depending on the level of knowledge) | | | | |
| G1 | Communication skills | Fluent oral, written and communication skills in several languages ability to communicate using a second language ability to be communicative in different situations possess the basics of academic writing in their native language language level diagnostic test | Full 4-year education with achievement of at least 240 academic credits (of which 120 are contact classroom academic credits) with the possible transfer of credits in a second language where the student has an advanced level. The language level is determined by taking a diagnostic test. | Department of Kazakh and Russian, Department of English |
| G2 | Math literacy | Basic mathematical thinking at the communication level the ability to solve situational problems based on the mathematical apparatus of algebra and principals of mathematical analysis diagnostic test for mathematical literacy in algebra | Full 4-year study with achievement of at least 240 academic credits (of which 120 are contact classroom academic credits). If the diagnostic test is passed positively, the level is Mathematics 1, if it is negative, the level is Algebra and basic analysis | Department of Math |
| G3 | Basic Literacy in Natural Sciences | Basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science understanding of basic hypotheses, laws, methods, formulation of conclusions and assessment of errors | Full 4-year training with achievement of at least 240 academic credits (including 120 contact classroom academic credits). If the diagnostic test is passed positively, the level is Physics 1, General Chemistry, if it is negative – the level is Principles of Physics and the Basic Foundations of Chemistry | Departments in the areas of natural sciences |
| SPECIFIC | | | | |
| (implies reduced studying due to credit transfer, depending on the level of knowledge in competencies for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas) | | | | |
| S1 | Communication skills | Fluent bilingual oral, written and communicative skills ability to communicate fluently with a third language different style and genre writing skills skills of deep understanding and interpretation of own work of a certain level of complexity (essay) | Full credit transfer by language (Kazakh and Russian) | Department of Kazakh and Russian |
| Разработано: | | Рассмотрено: заседание УС Института | Утверждено: УМС КазННТУ | Страница 5 из 54 |

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| | | basic aesthetic and theoretical literacy as a condition for full perception, interpretation of the original text | | |
| S2 | Math literacy | Special mathematical thinking using induction and deduction, generalization and concretization, analysis and synthesis, classification and systematization, abstraction and analogy ability to formulate, substantiate and prove provisions application of general mathematical concepts, formulas and extended spatial perception for mathematical problems complete understanding of the basics of mathematical analysis | Transfer of credits in Mathematics (Calculus) I | Department of Math |
| S3 | Special literacy in the natural sciences (Physics, Chemistry, Biology and Geography) | A broad scientific perception of the world, a fundamental understanding of natural phenomena critical perception for understanding the phenomena of the world cognitive abilities to formulate a scientific understanding of the forms of existence of matter, its interaction in nature | Transfer of credits in Physics I, General Chemistry, General Biology, Introduction to Geology, Introduction to Geodesy; Educational practice, etc. | Departments in the areas of natural sciences |
| S4 | English | Readiness for further self-study in English in various fields readiness to gain experience in project and research work using the English language | Transfer of credits in English language above academic to professional level (up to 15 credits) | Department of English |
| S5 | Computer skills | Basic programming skills in one modern language use of software and applications for teaching various disciplines | Transfer of credits in Introduction to information and communication technologies, Information and communication technologies | Department of Software Engineering |
| S6 | Socio-humanitarian competences and behavior | - Understanding and awareness of the responsibility of every citizen for the development of the country and the world - the ability to discuss ethical and moral aspects in society, culture and science | Transfer of credits in modern history of Kazakhstan (except for the state exam) | Department of Social Studies |
| | | critical understanding and ability to debate on modern scientific hypotheses and theories | Transfer of credits in philosophy and other humanitarian disciplines | |
| PROFESSIONAL | | | | |

| (implies reduced studying due to credit transfer depending on the level of knowledge in competencies for college graduates, AV schools, universities) | | | | |
|---|---------------------------------|--|--|-----------------------|
| P1 | Professional competencies | <ul style="list-style-type: none"> - Critical perception and deep understanding of professional competencies at level 5 or 6 - ability to discuss and argue on professional issues within the framework of the mastered program | Transfer of credits in basic professional disciplines, including Introduction to the specialty, Engineering ethics, Technology of robotic production, Technological objects of automation, Theoretical foundations of electrical engineering, Technological measurements and devices, Mathematical foundations of control theory, Automation electronic devices. | Graduation Department |
| P2 | General engineering competence | <ul style="list-style-type: none"> - Basic general engineering skills and knowledge, ability to solve general engineering tasks and problems - be able to use application packages for processing experimental data, solving systems of algebraic and differential equations | Transfer of credits in general engineering disciplines (Engineering Graphics, Descriptive Geometry, Basic Electrical Engineering, Basic Microelectronics) | Graduation Department |
| P3 | Computer engineering competence | <ul style="list-style-type: none"> - basic skills of using computer programs and software systems for solving general engineering tasks | Transfer of credits in Computer graphics, Computer modeling and programming in MatLab | Graduation Department |
| P4 | Socio-economic competence | <ul style="list-style-type: none"> - critical understanding and cognitive abilities to argue on contemporary social and economic issues - a basic understanding of the economic evaluation of objects of study and profitability of projects | Transfer of credits in social and humanitarian and technical and economic disciplines to offset the electives | Graduation Department |

The university may refuse to transfer credits if a low diagnostic level is confirmed or in the completed disciplines the final grades were lower than A and B.

3 Requirements to complete the course and receive a diploma

Mandatory standard requirements for graduation and assignment of an academic degree of bachelor: mastering at least 240 academic credits of theoretical studies, performing the final thesis or passing the state exam in the specialty.

Special requirements for graduation in this program.

graduate should know:

- English (technical);

- principles of building electronic circuits and their functioning,
- principles of construction and operation of radio engineering, electronics and telecommunications systems,
- features of network and telecommunication technologies,
- norms and standards of project documentation applied in the industry,
- modern world trends in the field of telecommunication technologies.

graduate must be able to:

- develop, implement, test and exploit information and telecommunication systems for various purposes;
- to design telecommunication systems and their elements in various fields;
- apply modern communication technologies for processing and transmitting large amounts of information, analyze it for decision making;
- have skills in teamwork within developers and users of telecommunications engineering systems.

4 Curriculum of the educational program

| Year of study | Code | Name of discipline | Cycle | The total amount of | lec/lab/pr/IWS | code of transfer credit | Prerequisites | Code | Name of discipline | Cycle | The total amount of | lec/lab/pr/IWS | code of transfer credit | Prerequisites |
|---------------|------------|---|-------|---------------------|----------------|-------------------------|-----------------|------------|--|-------|---------------------|----------------|-------------------------|---------------|
| 1 | 1 semester | | | | | | | 2 semester | | | | | | |
| | LNG 1051 | Beginner (A1) | G | 6 | 0/0/3/3 | S4 | Diagnostic test | LNG 1052 | Elementary English (A1) | G | 6 | 0/0/3/3 | S4 | LNG 1051 |
| | LNG 1052 | Elementary English (A1) | | | | | | LNG 1053 | General English 1 (A2) | | | | | LNG 1052 |
| | LNG 1053 | General English 1 (A2) | | | | | | LNG 1054 | General English 2 (A2) | | | | | LNG 1053 |
| | LNG 1054 | General English 2 (A2) | | | | | | LNG 1055 | Academic English (B1) | | | | | LNG 1054 |
| | LNG 1055 | Academic English (B1) | | | | | | LNG 1056 | Business English (B2) | | | | | LNG 1055 |
| | LNG 1056 | Business English (B2) | | | | | | LNG 1057 | Professional English (B2+) | | | | | LNG 1056 |
| | LNG 1012 | Kazakh (Russian) (A2) | G | 4 | 0/0/2/2 | S1 | Diagnostic test | LNG 1102.1 | Academic Kazakh (Russian) (B1) | G | 6 | 0/0/3/3 | S1 | LNG 1012.1 |
| | LNG 1012.1 | Academic Kazakh (Russian) (B1) | | | | | | LNG 1102.2 | Business Kazakh (Russian) (B2) | | | | | LNG 1012.1 |
| | LNG 1012.2 | Business Kazakh (Russian) (B2) | | | | | | 1105 | Electives | | | | | LNG 1012.2 |
| | KFK 101 | Physical education | G | 4 | 0/0/2/2 | | no | KFK 102 | Physical education | G | 4 | 0/0/2/2 | | AAP 106 |
| | HUM 100 | Contemporary history of Kazakhstan | G | 6 | 1/0/2/3 | S6 | no | GEN 101 | Engineering and Computer Graphics | B | 6 | 1/0/2/3 | P2 | no |
| | MAT 00110 | Algebra and introduction to mathematical analysis | B | 6 | 1/0/2/3 | S2 | Diagnostic test | MAT 101 | Mathematics I | B | 6 | 1/0/2/3 | no | MAT 100 |
| | MAT 101 | Mathematics I | | | | | | MAT 102 | Mathematics II | | | | | MAT 101 |
| | PHY 400 | Introduction to Physics | B | 6 | 1/1/1/3 | S3 | Diagnostic test | PHY 111 | Physics I | B | 6 | 1/1/1/3 | no | PHY 110 |
| | PHY 111 | Physics I | | | | | | PHY 112 | Physics II | | | | | PHY 111 |
| | ELC 198 | Theory of inventive problem solving | B | 6 | 2/0/1/3 | no | no | ELC 132 | Fundamentals of radio engineering and telecommunications (Introduction to specialty) | B | 6 | 2/0/1/3 | P1 | no |
| | Total: | | | | 38 | 38 | | | Total: | | | 40 | 40 | |
| 2 | 3 semester | | | | | | | 4 semester | | | | | | |
| | HUM 126 | Social & Political Knowledge | G | 8 | 4/0/0/4 | S6 | no | HUM 124 | Philosophy | G | 6 | 1/0/2/3 | S6 | no |
| | LNG 1053 | General English 1 (A2) | G | 6 | 0/0/3/3 | no | LNG 1052 | LNG 1054 | G | 6 | 0/0/3/3 | no | LNG 1053 | |
| | LNG 1054 | General English 2 (A2) | | | | | LNG 1053 | LNG 1055 | | | | | LNG 1054 | |
| | LNG 1055 | Academic English (B1) | | | | | LNG 1054 | LNG1056 | | | | | LNG 1055 | |
| | LNG1056 | Business English (B2) | | | | | LNG 1055 | LNG 1057 | | | | | LNG 1056 | |
| | LNG 1057 | Professional English (B2+) | | | | | LNG 1056 | 2108 | | | Electives | | LNG 1056 | |
| | MAT 102 | Mathematics II | B | 6 | 1/0/2/3 | no | MAT 101 | MAT 103 | Mathematics III | B | 6 | 1/0/2/3 | no | MAT 102 |

| | | | | | | | | | | | | | | | |
|---|------------|--|-----|----|---------|------|---------|------------|---|-----|---|---------|------|---------|-----|
| | MAT 103 | Mathematics III | | | | | MAT 102 | MAT 126 | Ordinary differential equations. Matlab | | | | | MAT 103 | |
| | CSE 174 | Information and communication technology | G | 6 | 2/0/1/3 | S5 | no | ELC 149 | Theory of electric communication | B | 6 | 1/1/1/3 | no | ELC 132 | |
| | PHY 112 | Physics II | B | 6 | 1/1/1/3 | no | PHY 111 | ELC 196 | Physical fundamentals of electronics | B | 6 | 1/1/1/3 | P1-3 | ELC 195 | |
| | 2209 | Electives | | | | | | ELC 130 | Directing systems of electric communication | B | 6 | 2/0/1/3 | P1-3 | ELC 132 | |
| | ELC 195 | Electrical Circuit Theory | B | 6 | 1/1/1/3 | P1-2 | PHY 111 | ELC 419 | Structured Cabling Systems | | | | | | |
| | Total: | | | 38 | 38 | | | Total: | | | | 36 | 36 | | |
| 3 | 5 semester | | | | | | | 6 semester | | | | | | | |
| | MAT 126 | Ordinary differential equations. Matlab | B | 6 | 1/0/2/3 | no | MAT 103 | MAT 127 | Partial differential equations. Matlab. | B | 6 | 1/0/2/3 | no | MAT 126 | |
| | MAT 127 | Partial differential equations. Matlab | | | | | MAT 126 | 3217 | Electives | | | | | | |
| | ELC 110 | Technology of digital communication | B | 6 | 1/1/1/3 | no | ELC 149 | ELC 144 | Network technologies | B | 6 | 1/1/1/3 | no | ELC 110 | |
| | AUT 146 | Fundamentals of Automation | B | 6 | 2/1/0/3 | P1-3 | PHY 111 | ELC 403 | Microprocessor and microcontroller devices and systems | S | 6 | 1/1/1/3 | no | ELC 402 | |
| | ELC 400 | Fourier analysis in telecommunication s | S | 6 | 2/0/1/3 | no | ELC 130 | ELC 404 | Radio transmitters and receivers devices | S | 6 | 2/0/1/3 | no | ELC 122 | |
| | ELC4 16 | Physics of Wave Processes | | | | | | | | | | | | | |
| | ELC 402 | Circuitry of electronic means | S | 6 | 1/1/1/3 | no | ELC 196 | | | | | | | | |
| | ELC 122 | Antenna-feeder devices and radio wave propagation | S | 6 | 2/0/1/3 | no | ELC 110 | | | | | | | | |
| | Total: | | | | 36 | 36 | | | Total: | | | | 24 | 24 | |
| 4 | 7 semester | | | | | | | 8 semester | | | | | | | |
| | ELC 151 | Technology of a wireless communication | S | 6 | 2/0/1/3 | no | ELC 404 | ELC 405 | Geographic information systems in telecommunications | S | 6 | 2/0/1/3 | no | ELC 147 | |
| | ELC 153 | Technology of mobile communication | | | | | | ELC 157 | Digital systems of TV and radiobroadcasting | | | | | | |
| | ELC 124 | Magistral communication networks | S | 6 | 1/0/2/3 | no | ELC 144 | ELC 129 | Ground-based and space-based systems of communications, of TV and radiobroadcasting | S | 6 | 2/0/1/3 | no | ELC 140 | |
| | ELC 131 | Fiber-optical systems in telecommunication s | | | | | | KTT 146 | Intellectual networks | | | | | S | 6 |
| | ELC 147 | Systems of satellite communication | S | 6 | 2/0/1/3 | no | ELC 404 | ECA 001 | Preparation & writing of thesis (project) | F A | 4 | | | | |
| | ELC 146 | Systems of satellite navigation and sounding | | | | | | ECA 103 | Thesis (project) defence | | | | | | F A |
| | ELC 140 | Designing of radio engineering and telecommunication s systems | S | 6 | 2/0/1/3 | no | ELC 144 | | | | | | | | |
| | ECA 001 | Preparation & writing of thesis (project) | F A | 4 | | | | | | | | | | | |
| | Total: | | | | 28 | 24 | | | Total: | | | | 28 | 18 | |

| Additional academic programmes (AAP) | | | | | Total number of credits | | | |
|--------------------------------------|--------------|----------------------------|---------|----------|---|------------|-----------|------------|
| Year | Code | Name of discipline | Credits | Semester | Cycle of disciplines | Credits | | |
| | | | | | | compulsary | elective | total |
| 2 | AAP 122, 132 | Physical education III, IV | 0 | 3-4 | | | | |
| 1 | AAP 101 | Internship | 2 | 2 | Cycle of general disciplines (G) | 56 | 12 | 68 |
| 2 | AAP 109 | Industrial internship I | 2 | 4 | Cycle of basic disciplines (B) | 96 | 12 | 108 |
| 3 | AAP 158 | Industrial internship II | 4 | 6 | Cycle of special disciplines (S) | 42 | 36 | 78 |
| 2, 3 | AAP 500 | Military training | | 3-6 | Total of theoretical study : | 194 | 60 | 254 |
| | | | | | Final attestation (FA) | 14 | 0 | 14 |
| | | | | | Additional education | 8 | 0 | 8 |
| | | | | | Total | 22 | 0 | 22 |
| | | | | | Auditorium volume of credits of theoretical training | 97 | 30 | 127 |

5 Descriptors of the level and volume of knowledge, skills, abilities and competencies (*to describe*)

A - knowledge and understanding of:

A1 - the scientific principles underlying the study of general professional and special disciplines, containing both basic and in-depth courses for fundamental training in the field of radio engineering, electronics and telecommunications;

A2 - principles of operation and technical characteristics of radio-electronic equipment, switching and communication facilities, signaling protocols; measurement techniques in communications and electronics;

A3 - collaborative analysis methodologies; design and decision making in difficult social and professional situations; ways of communicating and reconciling points of view; formatting and presentation of analytical and project documentation.

B - application of knowledge and understanding:

B1 - self-development and proposal of various options for solving professional problems using theoretical and practical knowledge;

B2 - for the design of radio engineering systems, electronics and telecommunications networks, taking into account real constraints (environmental and social impact, manufacturability and sustainable development);

B3 - for the organization of work on the collection, storage and processing of information used in the field of professional activity.

C - the formation of judgments:

C1 - on modern information transfer systems, new technologies in radio engineering, electronics and telecommunications;

C2 - about modern approaches in telecommunication technologies for creating multi-service and intelligent networks, at the same time being able to compare, formulate conclusions, build their own arguments, express and justify their position;

C3 - about modern technical support equipment for radio engineering and telecommunication systems, which allow creating optimal variants of communication networks and corresponding electronic equipment.

D - personal abilities:

D1 - awareness of the social importance of the profession, adherence to the principles of professional ethics, improvement of professional and personal qualities of a specialist in the field of radio engineering, electronics and telecommunications;

D2 - the desire to develop intellectual, moral, communication, organizational and managerial skills;

D3 - the ability to listen, persuade and argue, the ability to find a compromise, to relate their opinion with the opinion of the team.

6 Competences after completion of curriculum

B - Basic knowledge and skills

B1- be able to analyze current problems of the modern history of Kazakhstan;

B2 - to know and put into practice the basics of professional ethics in engineering;

B3 - to know modern and perspective directions of development of telecommunication and information networks and systems, radar and radio navigation systems, computer technologies, modern software.

P - Professional competencies, including according to the requirements of industry professional standards:

P1 - a wide range of theoretical and practical knowledge in the professional field;

P2 - the ability to design and install communication equipment; work with various communication networks; set up telecommunications equipment;

P3 - to provide technical support to users.

O - Universal, social and ethical competences:

O1 - the ability to learn continuously, to concentrate; be confident in the face of uncertainty; have a high level of spatial and logical thinking;

O2 - to be able to work in a team, have organizational skills, set priorities, quickly master new knowledge and skills, put them into practice;

O3 - to be result-oriented, to plan and organize self-development effectively;

O4 - is able to freely use English as a means of business communication, a source of new knowledge

C - Special and managerial competencies

C1 - independent management and control of the processes of labor and educational activities within the framework of the strategy, policies and goals of the organization, discussion of the problem, argumentation of the findings and competent handling of information;

C2 - the ability to motivate to solve certain tasks, the ability to be responsible: for the result of the work at the level of the unit or enterprise

C3 - the ability to demonstrate a set of skills to manage the process of work, the ability to choose methods, methodologies and evaluation criteria for obtaining results, distribute and delegate authority, form teams, and make decisions on the course of the production process.

7 Policy for obtaining Minor degree

When mastering at least 12 credits in the disciplines of the program, including the following mandatory disciplines:

- M1- English language;
- M2- Kazakh (Russian) language
- M3 - Modern history of Kazakhstan;
- M4 - Physics 1 and 2;
- M5 - Mathematics 1,2,3;
- M6- Theory of electrical circuits;
- M7 - Fundamentals of radio engineering and telecommunications (introduction to the specialty);
- M8 - Fundamentals of electronic and measuring equipment;
- M9 - Theory of electrical communication

An additional Minor degree is assigned with the issuance of a supplement to the state diploma.

8 ECTS Diploma Supplement

ECTS - European Credit Transfer and Accumulation System is a pan-European system of accounting for students' academic work during the study of an educational program or course. In practice, the ECTS system is used when students move from one educational institution to another throughout the European Union and others who have adopted this system, including the Republic of Kazakhstan. One academic year corresponds to 60 ECTS credits (36 credits to the Republic of Kazakhstan), which is about 1,500–1,800 training hours.

To get a bachelor's degree, you need to earn from 215 ECTS credits (129 credits of the Republic of Kazakhstan), and for the master's degree you need to get the missing up to 290 (that is, another 75 ECTS credits or 50 credits of the RK).

Supplement consists of 8 mandatory points in English / Kazakh / Russian. It is a standardized text that confirms compliance with the developed application to European standards. The form of the European Diploma Supplement is given in Appendix A.

Section 1 Information about the holder of the qualification: the last name, first name (as recorded in the passport), date and place of birth, identification number or student code.

Section 2 Information about the qualification obtained: the name of the qualification, Major specialty, additional Minor specialty (if any), the name and status of the higher education institution conferring the qualification in the native language, the name and status of the higher education institution awarding the qualification in English, language of study and examination.

Section 3 Information on the level of qualification: indicates the level of qualification - undergraduate (graduate, doctoral), the duration of study, entry requirements.

Section 4 Information about the content of study and the results obtained: indicate the form of training - full, distance, reduced full, the program requirement (the required amount for the program), the content of the educational program (compulsory and elective disciplines, coursework completed by the student, past practice, a diploma work with an indication of the complexity of disciplines, practices, term papers and dissertations, status (mandatory, optional, additional), final grades) in the RK and ECTS credits, national rating scale approved by the MONRK and its description, the mechanism for transferring grades to the European system, the general classification of qualifications.

Section 5 Professional qualification characteristics: does the qualification give an opportunity to move to the next level of education and what requirements for this must be fulfilled, professional status (what professional rights do students acquire with qualification).

Section 6 Additional information: additional information about the university, additional sources of information.

Section 7 Supplement certification: indicate the date of qualification, date of issuance, name, name of the official certifying the diploma supplement, signing the diploma itself; All this information is stamped.

Section 8 Information on the national system of higher education.

This supplement is issued only at the end of the university upon the application of a graduate on a reimbursable basis according to the norms established by the university.

To obtain the supplement, you must submit a written (electronic) application to the office of the university with a copy of the payment receipt.

The supplement is issued by the Office of the Registrar within 15 working days from the date of application and is registered in the journal of issuance and registration of diplomas and applications. Application forms are stored in the Office Registrar. An electronic record of the issuance of this Diploma Supplement is generated in the graduate's personal portfolio on the university portal.

Description of disciplines

Fundamentals of radio engineering and telecommunications (Introduction to specialty)

THE CODE – ELC132

THE CREDIT – 3 (2/0/1/3)

There is no PREREKVIZIT – no

PURPOSE AND PROBLEMS OF THE COURSE

Training of students in methods and bases of creation of information systems and shapers, transfers, reception and signal processing. Besides, students need to be informed of the main concepts, models and the principles of creation of telecommunication systems and networks, current trends of their development and standards in the field of telecommunications.

SHORT DESCRIPTION OF THE COURSE

Idea of trends of development of technologies of radio engineering and telecommunications, of the patterns defining communication between figures of merit, power parameters, economic indicators of systems. The general principles of radio engineering, transmission methods, reception, signal processings, ranges of the used frequencies, bases of the antenna-feeder equipment, the principles of creation of devices and the systems of a radio communication. Assignment, operating conditions, principles of creation, skeleton diagrams of telecommunication systems and networks, ways of representation and conversion of messages, signals and noises. Principles of creation and feature of multichannel telecommunication systems; basic concepts of digital systems and networks of subscriber access. Technical support of systems of radio engineering of telecommunications, general principles of creation of networks of new generation.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of discipline the student should:

- have an idea of trends of development of technologies of radio engineering and telecommunications, of the patterns defining communication between figures of merit, power parameters, economic indicators of systems;
- know the general principles of radio engineering, a physical entity of the phenomena occurring in radiotechnical devices; transmission methods, reception, signal processings, ranges of the used frequencies, bases of the antenna-feeder equipment, the principles of creation of devices and the systems of a radio communication; assignment, operating conditions, principles of creation, skeleton diagrams of telecommunication systems, ways of representation and conversion of messages, signals and noises; the principles of creation and feature of multichannel

telecommunication systems with frequency, time and code multiplexing; the basic concepts of digital networks with integration of services and intelligent networks; top trends of modern development of telecommunication and radio systems (integration of communication services at a unified digital technological basis, integration of the mobile, fixed and satellite communication);

- be able to analyze structure of creation and characteristics (indicators) of devices and the systems of analog and digital information processing; apply methods of the analysis and synthesis, the technical solutions used in radiotechnical devices and telecommunication systems of transfer, reception and information processing.

Algebra and introduction to mathematical analysis

THE CODE IS MAT100

THE CREDIT – 3 (1/0/2/3)

PREREKVIZIT – diagnostic test

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of a course to acquaint students with the main ideas and concepts of algebra and the mathematical analysis and formation of the basic knowledge necessary for studying of the course "Mathematics 1".

Problems of a course – formation of skills for studying of mathematical disciplines and effective use of mathematical methods for the solution of research and practical tasks in professional area.

SHORT DESCRIPTION OF THE COURSE

"The algebra and introduction to the analysis" are aware the basic concepts of algebra, the mathematical analysis, differential and integrated calculations are given.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

Student

has to know:

- basic concepts of algebra;
- basic concepts of the mathematical analysis;
- main elementary functions;

has to be able:

- to find solutions of the equations and inequalities, the systems of the equations and inequalities;
- to transform algebraic and trigonometrical expressions;
- to solve text problems;
- to find a derivative of elementary functions;
- to investigate functions by means of a derivative;
- to find uncertain integral from elementary functions;

- to find a certain integral;
- to find the area of a curvilinear trapezoid.

Mathematics I

CODE – MAT00121

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Elementary School Mathematics / Diagnostic Test

GOAL AND OBJECTIVES OF THE COURSE

The main goal of the course is to provide the future specialist with a certain amount of knowledge in the sections of the “Mathematics I” course, which is necessary for studying related engineering disciplines. Introduce students to ideas and concepts of mathematical analysis. To focus on the formation of basic knowledge and skills with a high degree of their understanding of differential and integral calculus.

Course objectives:

obtain knowledge necessary for the effective use of rapidly developing mathematical methods; obtain the skill of building and researching mathematical models; possession of the fundamental sections of mathematics necessary for solving research and practical problems in the professional field.

BRIEF DESCRIPTION OF THE COURSE

In the course “Mathematics I”, the following sections are presented: introduction to analysis, differential and integral calculus

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

The study of this discipline will allow the student to apply the “Mathematics-I” course to solving simple practical problems, to find tools sufficient for their research, and to obtain numerical results in some standard situations.

Mathematics II

CODE – MAT00122

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics I

GOAL AND OBJECTIVES OF THE COURSE

The purpose of teaching the course “Mathematics II” is to form the bachelor's ideas about modern mathematics as a whole as a coherent system of theoretical knowledge.

The objectives of the course are to instill in students solid skills for solving mathematical problems with bringing the solution to a practically acceptable result. Develop primary skills of mathematical research of applied questions and the ability to

independently understand the mathematical apparatus contained in the literature related to the student's specialty.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics II" provides an accessible exposition of sections: elements of linear algebra and analytic geometry, differential calculus of functions of many variables, multiple integrals. "Mathematics II" is a logical continuation of the "Mathematics I" course.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

The study of this discipline will allow to put into practice the received theoretical knowledge and skills with a high degree of their understanding within the sections of the course, to use them at an appropriate level; translate into mathematical language the simplest problems posed in terms of other subject areas; acquire new mathematical knowledge using educational and information technologies; solve applied problems in the field of professional activity

Mathematics III

CODE – MAT00123

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics I, Mathematics II

GOAL AND OBJECTIVES OF THE COURSE

The purpose of teaching the course "Mathematics III" is the formation of basic knowledge and skills with a high degree of understanding of the sections of the course, helping to analyze and solve theoretical and practical problems.

Course objectives: instilling in students the skills to independently study educational literature, to carry out probabilistic and statistical analysis of applied problems; development of logical thinking and increasing the general level of mathematical culture.

BRIEF DESCRIPTION OF THE COURSE

The course "Mathematics III" includes sections: theory of series, elements of probability theory and mathematical statistics, and is a logical continuation of the discipline "Mathematics II".

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

Student

must know:

- theory of numerical series;
- theory of functional series;

- Fourier series;
- elements of probability theory and mathematical statistics;
- should be able to:
- Solve problems in all sections of the theory of series;
- find the probability of events;
- find the numerical characteristics of random variables;
- use statistical methods for processing experimental data;

Physics I, II

CODE – PHYS111-112

CREDIT – 6 (2/2/2/6)

PREREQUISITE – diagnostic test/PHYS110-111

GOAL AND OBJECTIVES OF THE COURSE

The main objective of teaching the course Physics I and Physics II is to form ideas about the modern physical world picture and the scientific worldview.

BRIEF DESCRIPTION OF THE COURSE

The disciplines of Physics I and Physics II are the basis of theoretical training for engineering and technical activities of graduates of higher technical schools and represent the core of the physical knowledge necessary for an engineer operating in the world of physical laws.

The course "Physics 1" includes the following sections: physical fundamentals of mechanics, the structure of matter and thermodynamics, electrostatics and electrodynamics. The discipline "Physics II" is a logical continuation of the study of the discipline "Physics 1", and forms a holistic view of the course of general physics as one of the basic components of the general theoretical training for bachelors of engineering and technical profile. The discipline "Physics II" includes the following sections: magnetism, optics, nanostructures, fundamentals of quantum physics, atomic and nuclear physics.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

the ability to use the knowledge of fundamental laws, theories of classical and modern physics, as well as the use of methods of physical research as the basis of the system of professional activity.

Contemporary history of Kazakhstan

CODE – HUM100

CREDIT – 3 (1/0/2/3)

PREREQUISITE – no

GOAL AND OBJECTIVES OF THE COURSE

The purpose of the course is to familiarize students of technical specialties with the main theoretical and practical achievements of national historical science on the problems of the history of modern Kazakhstan, a comprehensive and systematic study of the main stages of the formation and development of Kazakhstani society.

- analyze the features and contradictions of the history of Kazakhstan in the Soviet period;
- to reveal historical content of foundations of the laws of political, socio-economic, cultural processes at the stages of formation of an independent state;
- contribute to the formation of students' citizenship;
- educate students in the spirit of patriotism and tolerance, belonging to their nation, the Fatherland;

BRIEF DESCRIPTION OF THE COURSE

The course Modern history of Kazakhstan is an independent discipline and covers the period from the beginning of the twentieth century to the present day. Modern history of Kazakhstan is studying the national liberation movement of the Kazakh intelligentsia at the beginning of the 20th century, the creation of the Kazakh Autonomous Soviet Socialist Republic, as well as the process of the formation of a multi-ethnic society.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

- knowledge of events, facts and phenomena of the modern history of Kazakhstan;
- knowledge of the history of ethnic groups inhabiting Kazakhstan;
- knowledge of the main stages of the formation of Kazakh statehood;
- ability to analyze complex historical events and predict their further development;
- ability to work with all kinds of historical sources;
- ability to write essays and scientific articles;
- ability to operate with historical concepts;
- ability to lead a discussion;
- skills of independent analysis of historical facts, events and phenomena;
- public speaking skills.

Kazakh/Russian language

CODE – LNG101

CREDIT – 5 (0/0/5/5)

PREREQUISITE – diagnostic test

GOAL AND OBJECTIVES OF THE COURSE

- to teach students to perceive aurally statements on familiar topics related to home, study, free time;
- understand texts on personal and professional topics containing the most frequent words and phrases;
- be able to have a conversation on everyday topics; describe your experiences; tell your opinion; retell and evaluate the content of the book read, the film seen;
- be able to create simple texts on known topics, including those related to professional activities.

BRIEF DESCRIPTION OF THE COURSE

The language material of the course is selected in such a way that the student, mastering the lexical and grammatical minimum, has the opportunity to get acquainted with typical communicative situations and he himself has turned out in such situations to be able to evaluate them correctly and choose the appropriate model (strategy) of speech behavior.

The main focus of the course is carried through the process of transferring knowledge to learning the ability to use the target language in the implementation of various types of speech activity, such as reading (subject to read), listening (under the same condition) and producing texts of a certain complexity with a certain degree of grammatical and lexical correctness.

Materials for the classes are selected so that students who study Kazakh / Russian language acquire the skills of reading, writing and understanding speech based on a general knowledge of the basics of grammar (phonetics, morphology and syntax) and phrases in the process of constant repetition with the gradual complication of tasks.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

The student, on the condition of active organization of work in the classroom and conscientious homework by the end of the first semester, acquires skills and abilities corresponding to the European level A2 (Threshold by ALTE classification), that is, it turns out to be on the threshold of independent language proficiency.

English

CODE – LNG1051-1057

CREDIT – 12 (0/0/12/12)

PREREQUISITE – diagnostic test/LNG1051-1056

LNG1051

GOAL AND OBJECTIVES OF THE COURSE

Discipline “Beginner English” is intended primarily for learning from scratch. This course is also suitable for those who have only elementary knowledge of the language. After passing this level, the student will be able to confidently communicate on basic topics in English, learn the basics of grammar and achieve basis for improvement of their skills at the next stage of learning English.

Post requisites of the course: Elementary English.

LNG1052

GOAL AND OBJECTIVES OF THE COURSE

Discipline “Elementary English” is the foundation of learning English, which is aimed at developing students' receptive skills (reading and listening) and productive skills (writing and speaking), analyzing basic knowledge, using and memorizing the main grammatical rules and learning the pronunciation and elementary vocabulary, as well as the promotion of self-study and critical thinking.

Course Prerequisites: Beginner English.

Post requisites of the course: General English 1.

LNG1053

GOAL AND OBJECTIVES OF THE COURSE

The goal of the “General English 1” course is to provide students with the opportunity to gain sufficient knowledge in order to become more free in everyday social and academic conditions. Students work on improving pronunciation, vocabulary and grammar. At this level, the main task is to consolidate the skills acquired earlier, learn how to make and correctly apply complex syntactic constructions in English, and also to achieve really good pronunciation.

Course prerequisites: Elementary English.

Post requisites of the course: General English 2.

LNG1054

GOAL AND OBJECTIVES OF THE COURSE

“General English 2” course is designed for students who continue to study “General English 1”. The course is focused on the ability to actively use in practice most aspects of English, conditional sentences, passive voice phrases, etc. At this stage, the student will be able to maintain a conversation with several people or express his

point of view. The student expands his vocabulary, which allows him to freely express his thoughts in any setting. At the same time, the speech will be replenished with various synonyms and antonyms of familiar words, phrases and stable expressions.

Course Prerequisites: General English 1.

Post requisites of the course: Academic English.

LNG1055

GOAL AND OBJECTIVES OF THE COURSE

The main purpose of the course “Academic English” is to develop academic language skills. Discipline is a language style that is used in writing academic works (paragraph, abstract, essay, presentation, etc.). This course is designed to help students become more successful and effective in their studies by developing critical thinking and independent learning skills.

Course Prerequisites: General English 2.

Post requisites of the course: Professional English

LNG1056

GOAL AND OBJECTIVES OF THE COURSE

“Business English” is English for business communication and career. Knowledge of business English is useful for negotiating and business correspondence, preparing presentations and informal communication with business partners.

Features of training are that it is necessary not only to master the vocabulary, but also to learn new skills: presentation, communication, language, professional.

Course Prerequisites: IELTS score 5.0 and / or Academic English

Post requisites of the course: Professional English, IELTS score 5.5-6.0

LNG1057

GOAL AND OBJECTIVES OF THE COURSE

“Professional English” course is designed for B2+ students whose goal is to enhance students' language competence in relevant professional areas. The main objective of the course is to teach students to work with texts, both audio and written, in their specialty. The curriculum is built on the necessary vocabulary (words and terms), often used in English for special purposes. Students will acquire proficiency in English through integrated learning based on content and language, learn vocabulary in order to read and understand original sources with a high degree of independence, and practice various communication patterns and vocabulary in specific professional situations.

Course prerequisites: Business English.

Post requisites of the course: any elective course.

Information and communication technology (in English)

CODE – CSE174

CREDIT – 3 (2/1/0/3)

PREREQUISITE – no

GOAL AND OBJECTIVES OF THE COURSE

Teach to apply modern information technologies in the field of professional activity.
Course objectives include:

- Expand the basic concepts of computer systems architecture;
- To reveal the basic concepts of information and communication technologies and subject terminology;
- To teach working with software interfaces of operating systems;
- To teach how to work with data in a variety of views, both in tabular structured and unstructured form
- Teach to apply the basic principles of information security;
- Expand the concepts of data formats and multimedia content. To teach how to work with standard multimedia data processing applications. Use modern approaches to the presentation of the material;
- Expand the concept of modern social, cloud and email platforms and ways to work with them;
- Train to use algorithmic and programming methods for solving problems of automating business processes

BRIEF DESCRIPTION OF THE COURSE

The course contains a study program aimed at leveling the basic knowledge of students in the field of information and communication technologies. It contains a full range of topics, according to the Sample Curriculum of SCES, with a predominance of education of practical skills in working with data, algorithms and programming. The course is designed in such a way that would teach students not only the basic concepts of architecture and modern infrastructure of information and communication technologies, but also teach how to use these tools to solve problems of an applied nature. Teach how to optimize processes, apply adequate models and methods for solving practical problems using modern methods and tools of information technologies, automate routine processes, be productive and efficient.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

Students will know:

- Computer architecture;
- Architecture of computing systems

- Information and communications technology infrastructure;
- Interfaces of modern operating systems;
- Modern tools for working with data of various nature and purpose;
- Types of information security threats, principles, tools and methods for data protection;
- Python programming language

Students will be able to:

- Work with interfaces of modern operating systems;
- Work with modern application software to work with data of various nature and purpose;
- Use modern social, cloud, email platforms for organizing business processes;
- Program in an algorithmic programming language;
- Analyze, model, design, implement, test and evaluate information and communication technology systems

Philosophy

CODE – HUM124

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Modern history of Kazakhstan

GOAL AND OBJECTIVES OF THE COURSE

The purpose of the course is the formation of cognitive, operational, communicative, self-educational competencies.

to solve problems:

- contribute to the development of adequate ideological orientations in the modern world;
- to form a creative and critical thinking among students;
- to distinguish between spiritual and material values and their role;
- contribute to the definition of their attitude to life and the search for harmony with the outside world

BRIEF DESCRIPTION OF THE COURSE

"Philosophy" is the formation of a holistic worldview which developed in the context of the socio-historical and cultural development of mankind. Familiarity with the main paradigms of teaching philosophy and education in the classical and post-classical traditions of philosophy. Philosophy is designed to develop sustainable life guidelines, finding the meaning of being as a special form of spiritual production. Contributes to the formation of the moral image of the individual with the ability of

critical and creative thinking. The theoretical sources of this course are the concepts of Western, Russian, and Kazakhstani scholars in history and theory of philosophy

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

- knowledge of basic terms, main concepts and problems of philosophy;
- knowledge of the main philosophical ways of solving worldview issues in the context of culture;
- ability to analyze the history of the development of philosophical thought;
- ability to identify alternative ways of posing and solving worldview questions in the history of human development;
- ability to identify the main theoretical approaches in the relationship between man and society;
- ability to master the technique of performing independent work;
- research skills and systematization of the material;
- skills to discuss freely and make rational decisions;
- skills of ethical principles in professional activities.

Ordinary differential equations

CODE – MAT00124

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics I-III

GOAL AND OBJECTIVES OF THE COURSE

The purpose of teaching the course “Ordinary Differential Equations. Matlab” is the formation of basic knowledge of sections of the course, helping to analyze, model and solve theoretical and practical problems using both analytical and numerical methods using Matlab; instilling in students the ability to independently study educational literature.

Course objective is to teach to recognize the types and forms of integrable equations and systems, integrate them and apply differential equations for the mathematical solution of applied problems.

BRIEF DESCRIPTION OF THE COURSE

Ordinary 1st order differential equations. Ordinary differential equations of higher orders. Systems of differential equations. Linear equations with variable coefficients. Numerical integration of differential equations and systems. Use Matlab to solve differential equations numerically.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

- master the methods of solving ordinary differential equations;
- set math problems;

- be able to build mathematical models;
- be able to solve problems modeled by differential equations using both analytical and numerical methods using Matlab

Partial differential equations. MatLab

CODE – MAT00125

CREDIT – 3 (1/0/2/3)

PREREQUISITE – Mathematics I-III, Ordinary differential equations. Matlab

GOAL AND OBJECTIVES OF THE COURSE

The aim of teaching the course “Partial differential equations. Matlab” is the formation of basic knowledge of the sections of the course, helping to analyze, model and solve theoretical and practical problems.

Course objectives: apply the theory of partial differential equations to solve and study applied problems from various fields of natural science, economics, medicine, biology and ecology; form ideas about the implementation of numerical methods for solving boundary value problems using Matlab

BRIEF DESCRIPTION OF THE COURSE

Basic equations of mathematical physics. Classical boundary value problems for partial differential equations. Analytical and numerical methods for solving classical boundary value problems. Using Matlab for the numerical solution of boundary value problems.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

- to master this mathematical apparatus, which allows to analyze, model and solve classical boundary value problems;
- master the methods of solving classical boundary value problems;
- be able to pose a problem, choose solution methods, both in analytical form and using computer technologies;
- use modern software package Matlab;
- to master the methodology and skills of numerical implementation of a mathematical model, analysis of the results obtained, their interpretation to refine the model;
- independently expand their mathematical knowledge.

Engineering and Computer Graphics

CODE – GEN101

CREDIT – 3 (1/0/2/3)

PREREQUISITE – no

GOAL AND OBJECTIVES OF THE COURSE

- development of spatial representation and imagination, constructive-geometric thinking, ability to analyze and synthesize spatial forms and relationships based on graphical models of space;
- teaching students how to work with graphical information of various kinds and contents, the basics of graphic presentation of information, methods of graphical modeling of geometric objects, rules for developing and designing design documentation, graphical models of phenomena and processes;
- students mastering the methods and tools of computer graphics, the acquisition of knowledge and skills to work with the computer-aided design system AutoCAD.

BRIEF DESCRIPTION OF THE COURSE

The study of ways to obtain certain graphical models of space based on orthogonal projection and the ability to solve problems connected with spatial forms and relations on these models. Mastering the basic principles and methods of geometric modeling and methodology for the development of graphic applications. Mastering the knowledge of constructing a drawing, the ability to read and write graphic and text design documentation in accordance with the requirements of regulatory documents, state standards. Acquaintance of students with the concept of computer graphics, geometric modeling, graphic objects, with modern interactive graphic systems for solving automation tasks of drawing and graphic works on the example of AutoCAD.

Formation of skills to use universal graphic systems for the development and editing of drawings using three-dimensional computer modeling, design automation in relation to the development and implementation of design documentation.

KNOWLEDGE AND SKILLS AFTER COURSE COMPLETION

As a result of studying the discipline, the student should know:

- theoretical foundations for complex and axonometric drawings;
- methods for constructing images - views, cross-sections, sections - of both existing and newly created products;
- rules for the execution and formatting of drawings, drafting design and text documents established by state standards;
- types of connection of component parts of products, their conventional images and designations;
- methods for constructing surface sweeps

be able to:

- build complex and axonometric drawings of geometric images;
- prepare textual and graphical design documentation;
- read the assembly drawing and prepare working drawings and sketches in accordance with state standards;
- navigate freely in projections with numerical marks;
- work in a universal AutoCAD environment with both 2M views and 3M objects.

have skills:

- perform and read the assembly drawing;
- construction of flat projection models of three-dimensional space;
- solutions of positional and metric problems;
- possession of modern computer-aided design tools.

have the following competencies:

- the ability to apply the methods of graphic representation of objects of professional activity, for example, engineering objects, schemes and systems;
- willingness to use information technology, including modern computer graphics, in its subject area;
- readiness to participate in the development of project and working design documentation in accordance with standards, specifications and other regulatory documents.

Social & Political Knowledge

THE CODE – HUM126

THE CREDIT – 4 (4/0/0/4)

PREREKVIZIT – no

This course involves the study of four scientific disciplines - psychology, political science, sociology and cultural studies, each of which has its subject, terminology and research methods. Interactions between these scientific disciplines are carried out based on the principles of information complementarity; integrability; methodological integrity of research approaches of these disciplines; generality of result-oriented teaching methodology; unified system representation of the typology of learning outcomes as formed abilities.

The theoretical sources of this course are the concepts of Western, Russian, and Kazakh scientists in the field of sociology, political science, and cultural studies.

Electrical Circuit Theory

THE CODE – ELC195

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Physics I

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of a course is studying of one of matter forms - an electromagnetic field and its manifestations in different devices of the equipment, assimilation of modern methods of modeling of electromagnetic processes, methods of the analysis of electrical circuits, instilling of skills of their correct use for the purpose of design, operation of different devices and systems.

SHORT DESCRIPTION OF THE COURSE

Fundamental laws, elements and parameters of electrical circuits. Conversion of chains. Methods of calculation of difficult direct current circuits. Nonlinear electrical circuits of a direct current. Introduction to the theory of electrical circuits of alternating current. Sinusoidal currents and tension. The resonant phenomena in alternating current circuits. Chains with interinduction. Three-phase current. Nonlinear alternating current circuits. Four-pole networks

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As result of studying of a course, students should:

- have an idea: about the basic laws and the principles which are the cornerstone of operation of electrotechnical devices and electrical machines;
- nobility and be able to use: laws of the theory and methods of the analysis of active and passive electrical circuits; standards and rules of creation and reading electric circuits;
- own: by methods of calculation and analysis of electrical circuits. Besides, according to university requirements, students should know and be able to use methods of the analysis of chains in the matrix and topological way and a method of state variables.

Theory of electric communication

THE CODE – ELC149

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Bases of radio engineering and telecommunications (Introduction to specialty)

PURPOSE AND PROBLEMS OF THE COURSE

Forming at the studying profound theoretical knowledge on the questions connected with the acquired profession on the basis of studying of patterns and

transmission methods of information, methods of the analysis and synthesis of networks and communication systems, the modern principles of forming and conversion of signals, questions of transmission performance rating of information, noise stability, modulation and demodulation, coding and decoding, throughput and efficiency of systems of telecommunication.

SHORT DESCRIPTION OF THE COURSE

The discipline "The theory of electric communication" is entered as the basic discipline (BD), an obligatory component, within profession of "The radio technician, the electronic engineer and telecommunication". The discipline is among the fundamental and determining by the contents vocational training specialists. It is aware of thermal power plant uniform methodological approach to the analysis and synthesis of modern systems and communication devices, on the basis of probabilistic models of information, messages, signals, noises and channels in telecommunication systems is accepted. Knowledge and skills acquired when studying this course are necessary for further professional activity.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of this discipline students should:

- have an idea of features optical and electric signals;
- know a physical entity of the processes happening in communication channels, cascades and nodes of conversion and signal processing;
- be able to analyze models of creation of communication channels, characteristics (indicators) of devices and the systems of analog and digital information processing; apply methods of the analysis and synthesis;
- gain practical skills of calculation of electric parameters of signals, creation of time and spectral diagrams of signals, researches of the main processes in communication systems.

Physical fundamentals of electronics

THE CODE – ELC 196

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Physics of I, Theory of electrical circuits

PURPOSE AND PROBLEMS OF THE COURSE

The course purpose – forming at students of knowledge of operation principles, parameters and characteristics of the main classes of modern semiconductor devices and integrated circuits and the modes of their work; forming at students of knowledge of fundamentals of circuit engineering of the analog electronic devices (AED) and methods of their analysis and also skills of the choice and creation of the AEU nodes;

studying of the measuring technologies integrating set of methods, approaches, program and logical providing to the organization of measurements; statuses and trends of development of measuring means and main methods of measurement of characteristics of electronic chains and signals, assessment of their accuracy.

SHORT DESCRIPTION OF THE COURSE

Physics of semiconductors. Semiconductor diodes. Transistors. Light-wave semiconductor devices. Microelectronics, integrated circuits (IC). Logical and linear integrated circuits. Indicators and characteristics of analog electronic devices. Principles, assignment and types of the feedback coupling (FC). Power amplifiers. Differential cascade. Operational amplifiers. Devices of analog signal processing. The inverting and not inverting amplifiers on OU. Active RC filters. Signal converters. Comparators and generators of electric fluctuations. Metrology. Measurements and measuring technologies. Digital instruments. Standardization and certification. Basic concepts, terms and definitions. Legislative base of certification.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of discipline the student should:

- nobility: features, key parameters and manufacturing techniques of electronic instruments and chips, classification of electronic instruments and chips; classification and the principles of functioning of the main analog devices and their basic elements, features and key parameters of differential and operational amplifiers, linear and nonlinear circuits on the basis of operational amplifiers with feedback couplings, legal and organizational and methodical bases of standardization, metrology and certification of products, services and quality systems;
- be able: build the simplest electronic circuits on electronic instruments and chips, to select element base for a specific scope of devices, to build multistage amplifiers, decisive amplifiers, active filters, generators of sine and relaxation wave oscillations, transformers, comparators and to carry out calculations of AEU, to define the main characteristics and parameters of electrical circuits and signals;
- have experience: removals of the main characteristics of electronic instruments and chips, the main characteristics of amplifiers (amplitude-frequency, phase-frequency, amplitude) and determination of parameters of different analog circuits, the choice of element base, use of properties of measurements in different practical areas;
- have an idea: about trends and perspectives of development of element base micro, opto-and a nanoelectronics, about operation principles of modern analog integrated microcircuits, about features of circuit engineering of the analog devices considering their implementation on integrated technology and ensuring stability of their work about classification of electrical measuring instruments, the principles of their action, features and the key metrological parameters; about processing of results

of measurements to give an assessment to the accuracy of means and results of measurements.

Fundamentals of Automation

THE CODE – AUT 146

THE CREDIT – 3 (2/1/0/3)

PREREKVIZIT – Physics I

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of the course "Automation Bases" is statement of bases of the modern theory of automatic control of linear and nonlinear systems. A problem of a course is also formation at students of practical skills to creation of mathematical models on the basis of a formalism of the theory of automatic control

SHORT DESCRIPTION OF THE COURSE

General information about the systems of automatic control. Linearization of the differential equations of systems of automatic control. Transfer function of a dynamic link. Temporary and frequency characteristics of a dynamic link. Logarithmic frequency characteristics of a dynamic link. Standard links of systems of automatic control and their characteristic. Concept of stability of linear systems. Creation of areas of stability. Indicators of quality of regulation of linear systems.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of development of discipline the student has to:

- nobility: methods of the description of systems of automatic control in the form of transfer functions; creation of temporary and frequency characteristics of systems of automatic control; methods of a research of stability of linear systems of automatic control and management; methods of assessment of quality of process of regulation.
- to be able: - to make block diagrams of systems of automatic control; to conduct a research of stability of linear systems of automatic control.
- to own: to carry out the analysis and calculation of key indicators: stability, qualities, reliability and technical and economic efficiency of work of systems of automatic control with use of computer aids;
- to be competent: in questions of the choice of elements of a system of automatic equipment to analyze and calculate the main of indicators of stability, quality, reliability and technical and economic overall performance of systems of automatic control.

Technology of digital communication

THE CODE – ELC110

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Theory of electric communication

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of discipline is statement of the principles and transmission methods of digital signals, the current state of systems of digital trunking; give an idea of opportunities and implementation of digital systems by transfer and processing, to understand the patterns defining properties of devices of digital data transmission and a problem of their functioning.

The main objective of "Technology of digital trunking" - to train students in theoretical knowledge and algorithms of creation of systems of digital trunking and also to impart it practical skills on methodology of engineering calculations of the main characteristics and to train in methods of technical operation of digital systems and networks.

SHORT DESCRIPTION OF THE COURSE

The discipline of "Technology of digital trunking" includes the following primary partitions: elements of systems of digital trunking; communication channels and their characteristics; narrow-band transfer; strip modulation and demodulation; synchronization methods in STsS; methods and devices of noiseproof coding; communication systems with feedback coupling; data compression in STsS.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of discipline students should:

- know the principles of creation of transmission systems and digital signal processing, hardware and program methods of increase in noise stability and transmission rate of digital communication systems, methods of increase in effective use of communication channels;
- be able to make calculations of the main functional assemblies, carry out the analysis of influence of external factors of a pas operability of means of communication;
- have skills of application of means of the computer equipment for calculations and design of software and hardware tools of communication.

Circuitry of electronic means

THE CODE IS ELC402

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Physical fundamentals of electronics

The PURPOSE AND PROBLEMS of the COURSE – studying of the principles of operation of amplifiers, generators and different transformers, their parameters and volt ampere characteristics and also principles of creation of the intensifying,

switching, generating and digital circuits on discrete semiconductor devices as diodes and transistors, and in integrated execution.

SHORT DESCRIPTION OF THE COURSE

The basic principles of creation of electronic circuits, the principles of functioning of gain and converting stages, generators of signals, electrical wave filters, the principles of work of integrated microcircuits, different aspects of use of element base of electronics in practical activities are considered. For this purpose in detail the principles of operation of different amplifiers on transistors and also integrated versions of amplifiers like differential cascades and operational amplifiers, their schematic execution is considered.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of a course the student should master the basic principles of creation of electronic circuits, the principles of functioning of gain and converting stages, generators of signals, electrical wave filters, the principles of work of integrated microcircuits, different aspects of use of element base of electronics in practical activities.

As a result of studying of discipline the student should:

- nobility: classification and the principles of functioning of the main devices and their basic elements, features and key parameters of differential and operational amplifiers, linear and nonlinear circuits on the basis of operational amplifiers with feedback couplings;
- be able: build multistage amplifiers, decisive amplifiers, active filters, sine wave generators, transformers, comparators and to carry out calculations of EU;
- have experience: removals of the main characteristics of amplifiers (amplitude-frequency, phase-frequency, amplitude) and determination of parameters of different analog circuits, choice of element base;
- have an idea: about an operation principle of modern integrated microcircuits, about features of circuit engineering of the analog devices considering their implementation on integrated technology and ensuring stability of their work.

Network technologies

THE CODE – ELC144

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Theory of electric communication, Technology of digital trunking

PURPOSE AND PROBLEMS OF THE COURSE

Provide future specialist with knowledge of the modern network technologies which are widely used in the different directions of telecommunications.

SHORT DESCRIPTION OF THE COURSE

The discipline acquaints students with modern telecommunication technologies and the principles of their creation. Fundamental questions of the theory of networks, in particular, a reference model of OSI, technology of packet switching for creation of modern network infrastructure are considered; network devices, stack of protocols of TCP/IP, protocol of network interconnection of IP; addressing and routing in networks. Different technologies of local and wide area networks, voice transfer and video in IP networks are studied; creation of network on the basis of the concept of NGN; management of multimedia sessions; quality of service in networks with package switching: ensuring required bandwidth, influence of delays on QoS, influence of a jitter, impact of losses.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of discipline the student should:

- nobility: reference models of creation of networks; basic technologies of local area networks, their features, access methods, specifications; the main algorithms and protocols used in networks; creation of high-performance channels of wide area networks; equipment of information transfer and means of telecommunications; addressing and routing in networks, the principles of voice transmission and video, mechanisms of support of the guaranteed quality of service of QoS;
- be able: put and solve problems of design of multiservice local (corporate) and city communication networks; select the corresponding equipment, calculate the throughput of networks, give transmission performance rating (QoS) of voice and information packets; apply the principles of modeling when calculating networks.
- receive skills of the independent analysis, development, mastering and design of modern communication systems.
- have an idea of a trend of development of network technologies at the present stage; about the network protocols of different level which are widely applied now.

Antenna-feeder devices and radio wave propagation

THE CODE IS ELC122

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Bases of radio engineering and telecommunications (Introduction to specialty), Theory of electric communication, Theory of transfer of electromagnetic waves

PURPOSE AND PROBLEMS OF THE COURSE

Training of specialists in the field of creation and ensuring functioning of antenna-feeder devices in the systems of a radio communication taking into account

features of distribution of radio waves of various ranges and taking into account influence of the spreading surface, the troposphere and an ionosphere.

Problems of discipline is studying: main types of feeding lines and elements of a feeding path; the main designs and parameters of the transferring and reception antennas, distribution of radio waves in free space and in terrestrial conditions taking into account influence of the environment on characteristics of systems of a radio communication.

SHORT DESCRIPTION OF THE COURSE

General questions of the theory of distribution of radio waves. Distribution of terrestrial radio waves. Influence of the troposphere and ionosphere on distribution of radio waves. Element base of the antenna-feeder equipment. Feeding lines and passive devices. Regular transmission lines. Transmission lines of final length. Passive devices on the basis of transmission lines. Antennas. Parameters of the transferring and reception antennas, linear antennas, aperture antennas, antenna lattices, features of antennas of different function and ranges.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of discipline students have to:

- nobility: the principles of action, key parameters and characteristics of various types of the transferring and reception antennas in the systems of a radio communication taking into account influence of the land surface and properties of the environment of distribution;
- to be able: to develop and prove corresponding to the specification and the modern level of development of the theory and the equipment of a design of antenna-feeder devices of systems of a radio communication;
- to have skills: main methods of calculation of parameters and characteristics of antenna-feeder devices of systems of a radio communication; methods of calculation of tension of the field in a reception point for radio lines of systems of a radio communication and TV and radio broadcasting taking into account influence of the land surface and properties of the environment of distribution

Microprocessor and microcontroller devices and systems - MMDS

THE CODE – ELC403

THE CREDIT – 3 (1/1/1/3)

PREREKVIZIT – Circuitry of electronic means

PURPOSE AND PROBLEMS OF THE COURSE

Studying of structure of the organizations and principles of operation of digital devices. Assignment and structure of operational blocks, functional assemblies of digital devices and microprocessor equipment.

SHORT DESCRIPTION OF THE COURSE

The discipline of "MMDS" studies structure of the organizations and the principles of operation of digital devices, microprocessor and microcontroller systems; assignment and structure of operational blocks, functional assemblies of digital devices and microprocessor equipment.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

The student should know: arithmetic and logical bases of digital devices, principles of work of the TsU main nodes, principles of operation of microprocessors and microcontrollers and systems of their commands, bases of design of Ministry of Railways and development of the microprocessor equipment.

The student should be able: use reference and information materials on microprocessors and their elements; carry out: arithmetic operations in numeration systems, operation with straight lines the return and branching codes; build: Carnot's cards, schemes of combinational digital devices, time diagrams of combinational digital devices, consecutive digital devices

The student should have skills: researches of combinational logic circuits, operation of triggers, operation of counters, coders and decoders, multiplexers and demultiplexers, analog-to-digital converter and digital-to-analog converter.

Technology of wireless communication

THE CODE – ELC151

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Technology of digital trunking, Network technologies

PURPOSE AND PROBLEMS OF THE COURSE

To train students in the principles of the organization and technologies of wireless communication (VS), to show methods of division of channels, their difference from the TCh standard channels; to teach methods of divisions of signals with use of an optical and radio communication, to technical concepts of creation of the BS systems; to consider systems with expansion of a range and also the principles of creation of wireless local networks

SHORT DESCRIPTION OF THE COURSE

In modern radio engineering the term wireless networks of communication belong to networks which are urged to replace wired or cable networks of communication. The discipline "Technology of wireless communication" considers current trends and technologies of a wireless radio communication, the principles of creation of a logical and physical structure of wireless networks of information transfer, methods of diversity of signals with use of optic communication and a radio

communication, technical concepts of creation of wireless systems, systems with expansion of a range and also the principles of creation of local wireless networks.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of this discipline students should:

have an idea:

- about trends of development of BS technologies;
- about the patterns defining communication between figures of merit of channels, power parameters of a system, indicators of effective use of frequency bands and capacities, economic indicators of the BS systems;

nobility:

- technical concepts of creation of wireless systems; key parameters of radio channels and methods of determination of these parameters;
- main methods of calculation of power parameters of the BS systems and technical parameters of networks; assignment and functional diagrams of the BS centers;

- ways of multi-station access and field of their application; key technical parameters of standards of the BS systems,

- methods of diversity of signals;

- skeleton diagrams of systems with expansion of a range; differences of an optic and radio communication;

- methods of use laser and BS infrared systems; the main concepts of systems with an expanded range;

- principles of creation of wireless local area networks;

be able:

- calculate and select the key power parameters of the equipment: radius of a cell (cover zone) and so-called, proceeding from the existing norms on link quality and actual parameters of the route BS;

- operate the different mobile devices used for the BS organization;

- develop the frequency and territorial plan at the set standards of the BS system for the set area.

Radio-transmitting and radio-receiving devices

THE CODE IS ELC

THE CREDIT – 3 (2/0/1)

PREREKVIZIT Fundamentals of radio engineering and telecommunications (Introduction to specialty), the Theory of electric communication, the Theory of transfer of electromagnetic waves, the Electronic engineer and circuit designer, Antenna-feeder devices and radio wave propagation

The **PURPOSE AND PROBLEMS** of the **COURSE** – studying of the principles of action, circuitry and possession of bases of calculation and setup of radio-transmitting and radio-receiving devices.

SHORT DESCRIPTION OF THE COURSE

Principle of a radio communication. Principles of creation of radio-transmitting devices and formation of radio signals; principles of creation of radio-receiving devices and processing of radio signals; qualitative characteristics of canals and highways of communication; principles of creation of modern communication systems.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of development of a subject matter the student has to be able:

- to read the schematic diagram of radio-transmitting and radio-receiving devices and their separate cascades;
- to use reference books and normative and technical documentation on radio-transmitting and radio-receiving devices;
- to carry out the calculations connected with determination of values of parameters of the mode and elements of devices;
- nobility:
 - principle of action and field of use of radio-transmitting and radio-receiving devices;
 - block diagrams of radio-transmitting and radio-receiving devices;
 - schematic diagrams of radio-transmitting devices and their separate cascades;
 - appointment and principles of action of the main knots of the radio receiver;
 - methods of consolidation and division of signals in multichannel communication systems.

Fiber-optical systems in telecommunications

THE CODE – ELC131

THE CREDIT – 3 (1/0/2/3)

PREREKVIZIT – Technology of digital communication, Network technologies

The **PURPOSE AND PROBLEMS** of the **COURSE** – statement of the principles and transmission methods of signals on fiber optic cables, scientific bases and the current state of the fiber optic communication system.

SHORT DESCRIPTION OF THE COURSE

Types and the main types of optical linear constructions of communication, their constructive, utilization properties, electric parameters are considered; requirements to bandwidth; model of a fiber transmission system; optical plugs, joints and passive optical devices; multiplexing with division longwise waves; technological processes at

operation, repair and construction of optical linear constructions; safety regulations during the work on lines.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of studying of this discipline the student should:

nobility:

- operation principle, functional diagrams, constructive devices of the main nodes of the SMALLPOX equipment;

- bases of the theory, calculation and operation of fiber optic cables and systems of a fiber line of communication of the enterprises and objects of telecommunication;

- main technical characteristics, functional diagrams, construction of the OSP modern equipment;

be able:

- perform measurements of key parameters of canals and highways of SMALLPOX;

- analyze results of measurement and set their compliance to existing rules;

- read skeleton diagrams and functional diagrams of the main nodes of the TsVOSP equipment;

- to accurately represent the main directions and perspectives of development of systems and technologies of communication, to know the organization of the enterprises of telecommunication, key parameters and requirements of a fiber line of communication.

Systems of satellite communication

THE CODE – ELC147

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Technology of digital communication, Radio transmitters and receivers devices

The PURPOSE AND PROBLEMS of the COURSE – studying of technologies, principles of creation and functioning, the main characteristics of modern satellite systems, perspective design methods and modeling of satellite systems.

SHORT DESCRIPTION OF THE COURSE

Features of creation of the satellite communication systems used for information transfer and also the equipment of satellite repeaters and ground stations. The signals used in satellite channels, their characteristics, versions and noise characteristics in these channels at different types of multiple access.

Transfer of voices/data, video, conference communication, access to the Internet by means of providing satellite links. The selected communication networks and broadcastings, a monitoring system and control of ground satellite stations and

channels of satellite communication that allows to manage the equipment and to save data in the database and also to expand the range of services of satellite communication.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

The student should know: purpose of different types of satellite systems; theoretical bases of creation and functioning of satellite communication systems; theoretical bases of noise stability of satellite links; techniques of calculations of the main technical characteristics of satellite communication systems; the physical processes happening when functioning navigation satellite systems, the basic principles of their creation and use of information developed by them in the integrated systems of navigation and management of mobile objects.

Be able to use the gained knowledge for execution of power calculations and the general design of satellite communication systems.

Digital systems of TV and radiobroadcasting

THE CODE – ELC157

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Technology of digital trunking, Network technologies, Communication networks and switching systems

The PURPOSE AND PROBLEMS of the COURSE – acquisition by students of knowledge in the area: constructions of digital systems of sound and TV broadcasting; standards of signal transmission of sound broadcasting and television; convergences of systems of broadcasting and data transmission.

SHORT DESCRIPTION OF THE COURSE

General information about the systems of TV and radio broadcasting. Principles of forming and transfer of a sound broadcasting signal. Encoding techniques of sources of broadcasting signals of TV and radio broadcasting. A sound broadcasting signal, its parameters and processing on the PC. Standards of analog television. Parameters of the color image. Chroma signals and color-difference signals. Standards of the color television: NTSC, PAL, SECAM. Quality of color TV of the image. ATsP methods of sound broadcasting signals. Methods and problems of a compression of digital sound and TV signals. Systems and standards of digital broadcasting. Models of radio channels in the systems of broadcasting.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

As a result of mastering of discipline the student should show the following results of education:

Nobility: rules of creation of speech constructions in technical documentation; methods and writing methods, technical means for record, processing and storage of

audiovisual signals; functionality of the personal computer for work with broadcasting signals; algorithms of processing of audiovisual signals by means of packets of computer application programs; parameters of modulation and channel coding in radio systems with multibeam distribution of signals; techniques of frequency planning and design of digital networks of TV and radio broadcasting, including with use of the artificial satellite on a geostationary earth orbit;

Be able: to independently study and analyze technical literature in the field of TV and radio broadcasting; prove structure of technical means for record and processing of audiovisual signals; use functionality of the computer for work with broadcasting signals.

Designing of radio engineering and telecommunications systems

THE CODE – ELC140

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Technology of digital trunking, Network technologies, Communication networks and switching systems

PURPOSE AND PROBLEMS OF THE COURSE

Acquaint students with methodology and features of design of radio engineering and telecommunication systems and to impart skills of system approach for acceptance of technical solutions

SHORT DESCRIPTION OF THE COURSE

It is aware the order is stated, data on the main stages and design stages, contents and features of separate stages are provided. At design it is supposed that all technical solutions, from development of a mathematical model to the detailing of construction, should be accepted proceeding from need of optimization of all system by the accepted criteria of efficiency.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

The student should:

Nobility: ways of collecting, processing, analysis and systematization of scientific and technical information; principles and technique of system engineering; basic provisions of design standards.

Be able to develop mathematical models and to use them for the analysis and synthesis of systems; develop skeleton and functional diagrams of systems and complexes.

Receive skills of system approach in the analysis and optimum design of systems.

Intellectual networks

THE CODE – KTT 146

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Designing of radio engineering and telecommunications systems

PURPOSE AND PROBLEMS OF THE COURSE

To acquaint students with the concepts of the Intelligent Communication Network (ISS), which allow the provision of additional telecommunication services, including those controlled by the client

SHORT DESCRIPTION OF THE COURSE

Concept of the Intelligent network. Interrelation of new technologies. Architecture of ISS: elements of network; services and attributes, global functional plane, distributed functional plane, physical plane. Model of service of a call. Interfaces and protocols. Questions of implementation of ISS. Perspectives of development of ISS.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

Nobility: concept and architecture of an intelligent network (IN); program component of implementation of services ISS; communication of the components providing provision of services of the IC; interfaces and protocols; scheme of interrelation of an intellectual superstructure with telecommunication network; process model of service of a call; classification and characteristic of intellectual services.

Be able: apply concepts of IN to the specification of services; organize access for subscribers to the IN platform equipment.

Have skills of design of intelligent information systems.

Geographic information systems in telecommunication

THE CODE – ELC 405

THE CREDIT – 3 (2/0/1/3)

PREREKVIZIT – Information and communication technologies, Systems of satellite communication

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of a course is studying of the basic theoretical principles of creation and classification of modern geographic information systems and also forming at students of basic practical skills of their use for a solution of practical tasks.

SHORT DESCRIPTION OF THE COURSE

Basic concepts and definitions. Basic provisions of geoinformatics. Concept of a geographic information system (GIS) and geoinformation technology. Main scopes of geographic information systems and geoinformation technologies. Ratio of GIS and other types of information systems (community and distinctions). The generalized scheme GIS. Structure of functions and subsystems of GIS. Classification of GIS by different signs. Basic technologies of GIS and geoinformation technologies. Card as GIS basis. Geospatial data, main technologies of their collecting and representations.

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

The student should:

Nobility: basic concepts of geographic information systems and technologies; digital representation of space objects and phenomena.

Be able: use basic skills of work with the modern software of GIS-systems.

Own: by the main methods and methods of digital processing of space information.

Have an idea: about modern developments in the field of GIS-systems, both the domestic, and foreign companies, efficiency of their use, development perspectives.

Protection of the graduate work (project)

THE CODE – ECA103

THE CREDIT – 6

PREREKVIZIT

PURPOSE AND PROBLEMS OF THE COURSE

The purpose of execution of the thesis / degree project (T/DP) is: systematization, fixing and expansion of the theoretical knowledge gained during training; profound studying by the bachelor of specific objectives and questions according to subject DR/DP; development in bachelors of skills of independent work at execution of the developed subject DR/DP; participation in production of division where execution of DR/DP is conducted; acquisition of experience of representation and public protection of results of the activity.

Achievement of the goal is carried out in the way:

- compliances of subject of DR/DP to the modern level of development of science and technology;
- realities of a subject and relevance of the developed questions;
- wide use by the bachelor of modern information technologies and products of the software on the selected subject;
- providing high scientific-theoretical and DR/DP practical level;

SHORT DESCRIPTION OF THE COURSE

Preparatory stage of execution of the thesis: choice of subject DR/DP. Drawing up task for execution of the thesis / degree project. Approval of a task of the releasing department and the statement of a subject. Thesis execution order: after approval of a task for DR/DP the head and the student bachelor make the planned schedule of work on a task. By drawing up the planned schedule the student should be guided by the fact that registration and execution of DR/DP should be finished by the beginning of a preliminary thesis defense.

The contents of the thesis should conform to requirements of qualification characteristic for the direction of training of bachelors for Telecommunications.

The thesis should contain: the summary in three languages; contents of the explanatory note; introduction; pre-project work – an analytical research of problems on subject DR/DP and development of the main solutions on their technical implementation; practical part; conclusion; the list of the used literature; applications (if it is necessary).

KNOWLEDGE, ABILITIES, SKILLS ON END OF THE COURSE

The thesis / the degree project – the final qualification work of the student intended for objective control of degree of formation of knowledge, skills in the field of radio engineering, electronics and telecommunications.

When performing DR/DP the student has to show the following abilities and knowledge:

- to independently set the research task, to estimate its relevance and the social importance;
- to collect and process information on subject DR/DP;
- to study and to critically analyse the existing materials on a work problem;
- deeply and comprehensively to investigate the revealed problem;
- to develop, describe and to professionally reason the versions of the solution of the considered problem;
- to formulate valid conclusions, offers, recommendations about implementation of the received results in practical activities.

10 Перечень модулей и компетенций, приобретаемых бакалаврами по образовательной программе

Educational program "Telecommunication"

Academic degree: bachelor in information and communication technologies in the direction 6B062- "Telecommunication"

| Module name | Competencies | Disciplines forming the module |
|-------------|--------------|--------------------------------|
|-------------|--------------|--------------------------------|

[illegible]

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Appendix A
STANDARD APPENDIX FORM TO THE DIPLOMA
European translation system and accumulation of points (ECTS)




Kazakh National Research Technical University named after K.I. Satpayev
Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық университеті

DIPLOMA SUPPLEMENT

This Diploma Supplement follows the model developed by the European Commission, the Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value - judgments, equivalence statements or suggestions about recognition. Information should be provided in all eight sections. Where information is not provided, a reason should be given.

| | | |
|-----------|--|--|
| 1 | INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION | |
| 1.1 | Family Name | |
| 1.2 | Given Name | |
| 1.3 | Date of Birth (Day/Month/Year) | Republic Region, city (place of birth) |
| 1.4 | Student Identification Number | |
| 2. | INFORMATION IDENTIFYING QUALIFICATION | |
| 2.1 | Title of Qualification and the Title Conferred | Bachelor in Technics |
| 2.2 | Major | |
| 2.3 | Minor | |
| 2.4 | Name and Status of Awarding University in original language | Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық зерттеу университеті |
| 2.5 | Name and Status of Awarding University in English | Kazakh National Research Technical University named after K.I. Satpayev |
| 2.6 | Language of Instruction | |
| 3 | INFORMATION ON THE LEVEL OF THE QUALIFICATION | |
| 3.1 | Level of Qualification | Bachelor's level/ first-cycle degree of higher education |
| 3.2 | Official Length of Program | 4 or 3 years |

| | |
|--|--|
|  ҚАЗ ҰТЗУ | Kazakh National Research Technical University named after K.I. Satpayev Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық университеті |
| DIPLOMA SUPPLEMENT # _____ | |
| <i>This Diploma Supplement follows the model developed by the European Commission, the Council of Europe and UNESCO/CEPES. The purpose of this supplement is to provide sufficient independent data to improve the international 'transparency' and fair academic and professional recognition of qualifications (diplomas, degrees, certificates, etc.) It is designed to provide a description of the nature, level, context, content and status of the studies that were pursued and successfully completed by the individual named on the original qualification to which this supplement is appended. It should be free of any value - judgments, equivalence statements or suggestions about recognition. Information should be provided in all eight sections. Where information is not provided, a reason should be given.</i> | |
| 1 | INFORMATION IDENTIFYING THE HOLDER OF THE QUALIFICATION |
| 1.1 | Family Name |
| 1.2 | Given Name |
| 1.3 | Date of Birth (Day/Month/Year) <div style="float: right; text-align: right;"> Republic Region, city (place of birth) </div> |
| 1.4 | Student Identification Number |
| 2. | INFORMATION IDENTIFYING QUALIFICATION |
| 2.1 | Title of Qualification and the Title Conferred <div style="text-align: right;">Bachelor in Technics</div> |
| 2.2 | Major |
| 2.3 | Minor |
| 2.4 | Name and Status of Awarding University in original language <div style="text-align: right;">Қ.И.Сәтбаев атындағы Қазақ Ұлттық техникалық зерттеу университеті</div> |
| 2.5 | Name and Status of Awarding University in English <div style="text-align: right;">Kazakh National Research Technical University named after K.I. Satpayev</div> |
| 2.6 | Language of Instruction |
| 3 | INFORMATION ON THE LEVEL OF THE QUALIFICATION |
| 3.1 | Level of Qualification <div style="text-align: right;">Bachelor's level/ first-cycle degree of higher education</div> |
| 3.2 | Official Length of Program <div style="text-align: right;">4 or 3 years</div> |

| 3.3 | Access Requirements | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|--|---|--------------|-----|---------|--------------|---|---|--------|--------------|----|------|-------|--------------|----|------|-------|--------|---|---|-------|--------|----|------|-------|--------|----|------|-------|--------|---|---|-------|--------|----|------|-------|--------|----|------|-------|--------|---|---|-------|--------|--|--|
| 4 | INFORMATION ON THE CONTENTS AND RESULTS GAINED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Mode of Study | Full-Time | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.2 | Program Requirements | 129 credits of the Republic of Kazakhstan (240 ECTS credits), including General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Training – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3 | Program Details | Attached in transcript of records | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.4 | Grading Scheme | <table><tr><th>Evaluation</th><th>GPA</th><th>Point %</th><th>Appreciation</th></tr><tr><td>A</td><td>4</td><td>95-100</td><td>"Excellence"</td></tr><tr><td>A-</td><td>3,67</td><td>90-94</td><td>"Excellence"</td></tr><tr><td>B+</td><td>3,33</td><td>85-89</td><td>"Good"</td></tr><tr><td>B</td><td>3</td><td>80-84</td><td>"Good"</td></tr><tr><td>B-</td><td>2,67</td><td>75-79</td><td>"Good"</td></tr><tr><td>C+</td><td>2,33</td><td>70-74</td><td>"Pass"</td></tr><tr><td>C</td><td>2</td><td>65-69</td><td>"Pass"</td></tr><tr><td>C-</td><td>1,67</td><td>60-64</td><td>"Pass"</td></tr><tr><td>D+</td><td>1,33</td><td>55-59</td><td>"Pass"</td></tr><tr><td>D</td><td>1</td><td>50-54</td><td>"Pass"</td></tr></table> | Evaluation | GPA | Point % | Appreciation | A | 4 | 95-100 | "Excellence" | A- | 3,67 | 90-94 | "Excellence" | B+ | 3,33 | 85-89 | "Good" | B | 3 | 80-84 | "Good" | B- | 2,67 | 75-79 | "Good" | C+ | 2,33 | 70-74 | "Pass" | C | 2 | 65-69 | "Pass" | C- | 1,67 | 60-64 | "Pass" | D+ | 1,33 | 55-59 | "Pass" | D | 1 | 50-54 | "Pass" | | |
| Evaluation | GPA | Point % | Appreciation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 4 | 95-100 | "Excellence" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A- | 3,67 | 90-94 | "Excellence" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B+ | 3,33 | 85-89 | "Good" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 3 | 80-84 | "Good" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B- | 2,67 | 75-79 | "Good" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C+ | 2,33 | 70-74 | "Pass" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | 2 | 65-69 | "Pass" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C- | 1,67 | 60-64 | "Pass" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D+ | 1,33 | 55-59 | "Pass" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | 1 | 50-54 | "Pass" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.5 | Grading scale of the overall assessment (in original language) | Grade Point Average (GPA) 3.6 out of 4.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | INFORMATION ON THE FUNCTION OF THE QUALIFICATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Access to Further Study | Eligible for second-cycle higher education, graduate programs in master | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.2 | Professional Status | Under legislation of the Republic of Kazakhstan, a person who was taken Bachelor in Technics is qualified for posts or positions in the industrial, public and scientific sectors for which the qualification requirement is a first higher education degree in the major study. In some cases, the qualification requirement also includes the completion of studies in certain specified fields of minor study. The degree is also satisfied and corresponded to the Article 11 of the Directive of the European Parliament on the recognition of professional qualifications under level D of The European Union. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | ADDITIONAL INFORMATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | University Address | 22 Satpayev Street, Almaty, 050013, Kazakhstan alint@ntu.kz www.kazntu.kz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.2 | Further information source | http://edu.gov.kz/ru | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | CERTIFICATION OF THE SUPPLEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | Place and Date | 201 Almaty, Kazakhstan | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.2 | Rector | Beisembetov I./ Бейсембетов И.К. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| 7.3 | Official Stamp | |
| 8 | INFORMATION ON THE NATIONAL HIGHER EDUCATION SYSTEM | |
| <p>The education system of the Republic of Kazakhstan consists of basic secondary education, general upper secondary education, vocational upper secondary education, higher education and graduate education. The basic education consists of the 9-year compulsory school for all children from 6 to 15 years age.</p> <p>Post-compulsory education is given by the general upper secondary schools for 2 or 3 years and vocational upper-secondary institutions. The general upper secondary school provides 2- or 3-years, at the end of which pupils take the Unite National Test (UNT) examination for 2-year study and the Matriculation examination for the 3-year study. Vocational institutions provide 3-year programs, which lead to the upper secondary vocational qualifications with the further Complex Test Attestation (CTA).</p> <p>General eligibility for higher education is given by the UNT for the 4-year study, the Matriculation examination or the upper secondary vocational qualification with gained CTA results for 3-year higher education.</p> <p>Higher education studies are measured in credits. Study courses are qualified according to the workload required. One year of studies is equivalent to 1600 hours of student work on the average and is defined as 36 National credits or 60 ECTS credits. The credit system after recalculation complies fully with the European Credit Transfer and Accumulation System (ECTS).</p> | | |
| 8.1 | University Degree | The Government Decree on University Degrees (GOSO/2016) defines the compulsory objectives, extent and overall structure of degrees. The universities decide on the detailed contents, curricula, forms of instruction and structure of the degrees awarded. |
| 8.1.1 | First-Cycle (Bachelor) | <p>The first-cycle university degree (Bachelor) consists of 99 (184 ECTS) credits for 3 years of full-time study or 129 (240 ECTS) credits for 4 years. The degree is called the Bachelor of Technology in all fields of study except Medicine and Architecture. The determined English translation for all the degrees corresponds to the Bachelor of Science in the European countries and the USA.</p> <p>Studies forwarding to the degree provide the student with: (1) functional knowledge of the fundamentals of the major and minor subjects or corresponding study entities or studies included in the degree program as well as the prerequisites for the following studies in the field; (2) functional knowledge and experimental skills needed for scientific thinking and the use of scientific methods for research needs; (3) functional knowledge and learning skills, needed for studies, leading to graduate university degrees and continuous learning; (4) professional skills and capacity for applying the acquired learning in the professional field work and beyond; (5) three-lingual language capacity (Kazakh / English / Russian) and communication skills.</p> <p>Studies forwarding to the degree include at least General Studies – 30 (56 ECTS) credits, Basic Engineering Studies – 59 (110 ECTS) credits, Professional Studies – 40 (74 ECTS) credits, Elective Courses – 60 (112 ECTS) credits. Additionally, Practical Training – 6 (11 ECTS) credits, a Final Diploma Thesis – 3 (6 ECTS) credits.</p> |

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| 8.2.1 | Second-Cycle (Master) | <p>The second-cycle university degree (Master) consists at least 24 (45 ECTS) credits for 1-year full-time study, 36 (67 ECTS) credits for 1.5-years full-time study or 50 (93 ECTS) credits for 2-years full-time study. The degree is usually called Master of Technology or Master of Business Administration for 1 and 1.5-year full-time study; Master in Science for 2-years full-time study. The admission requirements for the second-cycle university degree (graduate) are a first-cycle university degree (undergraduate). General eligibility for the second-cycle education is given by a combination grade of the National Test of English Language unless an applicant has the certified IELTS test results with the overall scores - 6.0 and Proficiency Examination, which is corresponding to the GRE Subject Examination.</p> <p>Studies forwarding to the second-cycle university degree (Master) provide graduate with: (1) profound knowledge of the major subject or a corresponding entity and conversance with the fundamentals of the advanced studies in the field; (2) advanced knowledge and research skills needed to apply the scientific knowledge and research approaches required for the independent and demanding experimental work (dissertation); (3) good overall knowledge and professional skills in the major field needed for operating as an expert and developer in the field; (4) scientific knowledge and interests needed for the scientific (Doctoral) or postgraduate education devoted to cutting-edge science; (5) fluent professional English, communication and oral skills.</p> <p>Studies forwarding to the degree include at least Intermediate Studies – 8 (15 ECTS) credits and Advanced Studies – 16 (30 ECTS) credits. Additionally, Internship improving expertise – 6 (11 ECTS) credits, a Final Dissertation Work – 6 (11 ECTS) credits.</p> |
| 8.2 | Doctoral Degree (PhD in Science) | <p>Applicants can apply for the doctoral (Ph.D.) studies after the completion of a relevant second-cycle degree. General eligibility for Ph.D. education is given by a combination grade of the National Test of English Language unless an applicant has the certified IELTS test results with the overall scores - 6.0 and the Proficiency Examination, which is corresponding to the GRE Subject Examination, as well as at least the 3 year research experience in the relevant field. The aim of doctoral studies is to provide a student with in-depth and profound knowledge in their field of science through their scientific research and capabilities to produce novel scientific knowledge or solutions independently. The Doctor's degree takes minimum 3 years to complete. An applicant, who has been admitted to complete the Ph.D., Doctor's degree must take 12 (20 ECTS) credits of interdisciplinary study, show the independent and critical thinking in the field of research and write the Ph.D. dissertation to defend in public.</p> |