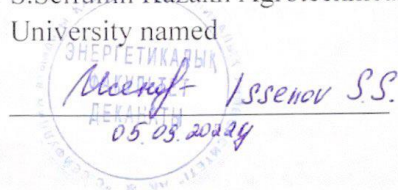


Ministry of Agriculture of the Republic of Kazakhstan
Non-profit Joint Stock Company "S.Seifullin Kazakh Agrotechnical University"

CONSIDERED
at the meeting of the Scientist
University Council
Protocol № 19 from 31.08.2022.

APPROVED
Dean of the Faculty *Energy*
S.Seifullin Kazakh Agrotechnical
University named


Исенов С.С.
05.08.2022

CATALOG OF ELECTIVE DISCIPLINES

Nur-Sultan 2022

Catalog of university and elective disciplines for the educational program 7M06204 Multiservice telecommunication technologies.– Nur-Sultan, 2022. - 12 pages.

This catalog contains a list and content, post- and prerequisites, the volume of credits of disciplines of university and elective components offered by the university for the development of bachelor's and master's degree programs and is intended for students, undergraduates studying under the credit system.

Explanatory note

Dear students (undergraduates, doctoral students)! With the credit system of education, a mandatory element of the educational and methodological complex of the educational program is the catalog of university and elective disciplines (CED) in the field of training. The CED is a list of disciplines included in the university component and the component for the selection of educational programs in the framework of the training area 7M062 Telecommunications.

The catalog of disciplines is used by students when drawing up an individual curriculum, developed personally by the student under the guidance of an adviser, taking into account the individual abilities of the student, his growth prospects, the needs of the labor market and production.

The catalog offers disciplines that allow students to form their educational trajectory in accordance with the educational program within the framework of the training direction.

In order to form their educational trajectory, a student (undergraduate, doctoral student) must master all disciplines of compulsory and university components in accordance with the educational program, as well as choose several elective disciplines from the catalog for study.

After successful completion of this program, graduates will be able to demonstrate:

LO1 Possess deep knowledge in the field of natural and mathematical sciences and history.

LO2 Possess in-depth knowledge of information and computer technologies, fundamentals and elements of telecommunications used in professional activities.

LO3 Demonstrate knowledge of the basics of design and installation, be able to operate radio engineering and infotelecommunication devices and systems, possess methods of calculating electrical circuits.

LO4 Possess a deep level of knowledge in the field of analog and digital electronic technologies, have experience in circuit modeling, demonstrate knowledge in the field of microprocessor systems and possess microcontroller programming skills.

LO 5 To be able to carry out calculations for the design of systems and networks of telecommunications, to use modern software packages of computer programs for calculations, modeling and automation of design of radio electronic devices and systems of telecommunications.

LO 6 Have knowledge of the theory of electrical and digital communications, about the methods, principles of operation of devices for processing and converting data transmission signals.

LO 7 To know the basics of radio electronic circuits and signals, radiation, propagation and receiving of radio waves, to distinguish the types of antenna-feeder devices, to know the technology of wireless communication and to know of their differences, to be able to calculate the wireless data network of wired and wireless systems.

LO 8 Apply theoretical knowledge in solving problems of designing radio

electronic and infocommunication systems.

LO 9 To demonstrate knowledge of the modern technology, requirements of standardization, metrological support and life safety in the development and operation of radio equipment and information and communication systems.

LO 10 To know the state language and one foreign language for providing and documenting of information, to be able to use the normative and legal documentation, typical for the field of information and communication technologies and communication systems, to be ready to read the project and working technical documentation.

Catalog of elective disciplines

| | | |
|----|--|---|
| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | English for academic purposes |
| 5 | Discipline code | AYaDAC 6208 |
| 6 | The cycle of discipline | BD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 2 |
| 9 | Level of training | Magistracy |
| 10 | Department | Foreign languages |
| 11 | Course | 2 |
| 12 | Trimester | 4 |
| 13 | Prerequisites | Foreign language / Prof.English |
| 14 | Post-requirements | Completion of the master's thesis |
| 15 | Summary of the discipline (names of topics) | Analysis, commenting, generalization, creation of scientific publications in a foreign language. Conducting scientific research. Communication in the appropriate social and communicative context (scientific conferences, seminars, round tables), the formation of linguistic and communicative competencies provided for by the level of the system of pan-European competencies of foreign language proficiency. |
| 16 | Results of discipline training | LO1 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Academic writing |

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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Methodological foundations of scientific research |
| 5 | Discipline code | MONI 5207 |
| 6 | The cycle of discipline | BD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 1 |
| 12 | Trimester | 2 |
| 13 | Prerequisites | History and philosophy of science. Management Psychology |
| 14 | Post-requirements | Research work of a master's student. Experimental research work of a master's student. |
| 15 | Summary of the discipline (names of topics) | Overview of the main directions of scientific research development in Kazakhstan and abroad. Methodology and methodology of scientific research. The choice of the direction of scientific research and the stages of research work. Processing of experimental research results. Registration of the results of scientific work and transfer of information. Implementation and effectiveness of scientific research. Scientific organization of intellectual work. Basic principles of research group management. |
| 16 | Results of discipline training | LO2,LO4 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Theory and practice of technical experiment |

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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Architecture of telecommunications networks and systems |
| 5 | Discipline code | ASST 5203 |
| 6 | The cycle of discipline | BD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 1 |
| 12 | Trimester | 1 |
| 13 | Prerequisites | Design and operation of telecommunication networks. Packet and hybrid switching networks. |
| 14 | Post-requirements | Modeling and optimization of telecommunication systems and networks. Research work of a master's student. Experimental research work of a master's student.. LPWAN for the Internet of Things |
| 15 | Summary of the discipline (names of topics) | The main trends in the development of modern networks, the direction of network development, the general architecture of new generation networks (NGN), the problems of transition to a new generation network, three-level NGN architecture on the IMS platform, the main scenarios of transition to NGN. |
| 16 | Results of discipline training | LO3,LO5 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Convergent networks |


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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Information security |
| 5 | Discipline code | IB 5204 |
| 6 | The cycle of discipline | BD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 1 |
| 12 | Trimester | 1 |
| 13 | Prerequisites | Algorithms and their complexity, Relational database design, computer networks, cryptography. |
| 14 | Post-requirements | Completion of the master's thesis |
| 15 | Summary of the discipline (names of topics) | Terminological foundations of general security. General methodological substantiation of the theory of information security. Stages of information security development. Requirements for the information security system. Classification and analysis of external security threats. Inclusions, types, exclusions and distortions of information. Functions and tasks of information protection. Methods of forming protection functions. Information security of the Republic of Kazakhstan. |
| 16 | Results of discipline training | LO7,LO10 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Security and confidentiality of cyber-physical systems |

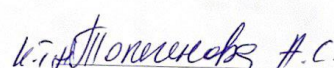
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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Methods and technologies of digital signal processing and post-processing of images |
| 5 | Discipline code | MTCOSPOI 5309 |
| 6 | The cycle of discipline | PD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 1 |
| 12 | Trimester | 1 |
| 13 | Prerequisites | Mathematics.Engineering mathematics.Physics.Digital devices and microprocessor technology.Theory of electrical circuits. |
| 14 | Post-requirements | System engineering. Embedded and touch devices. |
| 15 | Summary of the discipline (names of topics) | Signals. Sampling of continuous signals Z-transform. Digital filter. Impulse response, transfer functions of filters. Frequency characteristics of filters. The method of weighing, frequency sampling. Optimal digital filters. Noise. Remote sensing and data analysis. Satellite, passive and active shooting systems. scanner characteristics and their relation to the map scale. Laser and radar systems. Geometric correction of cosmic sensations. Processing of measurements. Improving spatial resolution. |
| 16 | Results of discipline training | LO2,LO3 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Scientific approaches to digital signal processing |


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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | LPWAN for the Internet of Things |
| 5 | Discipline code | LDIV 6308 |
| 6 | The cycle of discipline | PD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 2 |
| 12 | Trimester | 4 |
| 13 | Prerequisites | Wireless communication technologies. Internet of Things. Digital devices and microprocessor technology 1. Antenna –feeder devices and radio wave propagation. |
| 14 | Post-requirements | System engineering. Embedded and touch devices. |
| 15 | Summary of the discipline (names of topics) | The concept of IoT and IoE. LoRa modulation. Characteristics and frequency bands of LoRa and NB-IoT. Building an M2M/IoT network based on NB-IoT technology. LoRaWAN architecture. Network server, device classes, Scalability, Uplink and downlink messages. Gateways and nodes, antennas for LoRa. Building solutions and prototyping. Protocol: MQTT, HTTP integration. Modeling and data processing. Localization and network security. Large-scale network deployments. |
| 16 | Results of discipline training | LO4,LO6 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | M2M machine-to-machine communications |


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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Digital broadcasting systems |
| 5 | Discipline code | CST 6313 |
| 6 | The cycle of discipline | PD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 2 |
| 12 | Trimester | 5 |
| 13 | Prerequisites | Microwave and optical range devices. Methods of ensuring electromagnetic compatibility of radio-electronic means. |
| 14 | Post-requirements | Scientific and technical problems of radio engineering, electronics and telecommunications. Metrological support of telecommunication networks. |
| 15 | Summary of the discipline (names of topics) | Principles of digital television, high-quality and high-definition television systems, transmission of additional information, devices of optoelectronic and electro-optical transformations in television, transmission and distribution of digital television signals, transmission of television signals via radio channels, stereoscopic television systems. |
| 16 | Results of discipline training | LO5,LO7,LO8 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | System engineering |

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| 1 | Name of the direction of training | 7M062 Telecommunications |
| 2 | Name of the group of educational programs | M096 Communications and communication technologies |
| 3 | Code and name of the educational program | 7M06204 Multiservice telecommunication technologies |
| 4 | Name of the discipline | Embedded and touch devices |
| 5 | Discipline code | VSU 6304 |
| 6 | The cycle of discipline | PD/CC |
| 7 | Component | by choice |
| 8 | Number of credits | 5 |
| 9 | Level of training | Magistracy |
| 10 | Department | Radio engineering, electronics and telecommunications |
| 11 | Course | 2 |
| 12 | Trimester | 5 |
| 13 | Prerequisites | Algorithmization and programming in high-level languages. Digital devices and microprocessor technology 1,2. |
| 14 | Post-requirements | Completion of the master's thesis |
| 15 | Summary of the discipline (names of topics) | Classification of microprocessors and microcontrollers. Overview of modern microcontrollers. The general block diagram of the microcomputer. Representation of the main microcomputer devices: microprocessor, dense memory, interfaces, external devices, buses. Physical organization of memory. Basic architectural justifications of the organization of microcomputers. The history of the origin and background. Harvard and von Neumann architecture. Other types of architectures. Areas of application. CISC processor. RISC processor. |
| 16 | Results of discipline training | LO5,LO6,LO7,LO8 |
| 17 | The name of the Alternative Discipline for the discipline of the Component of choice | Introduction to Web Services and Embedded Systems Security |


Members of the author's team  (signature)

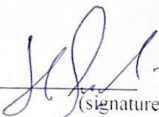
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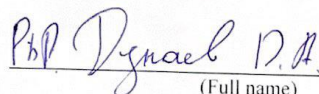


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Head of the Department  (signature)

 (Full name)