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
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APPROVED
Dean of the Faculty Energy
S.Seifullin Kazakh Agrotechnical
University named
Issenov S.S.
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CATALOG OF ELECTIVE DISCIPLINES

Nur-Sultan 2022

Catalog of university and elective disciplines for the educational program 7M06205 Radio-electronic technologies and systems.– Nur-Sultan, 2022. - 13 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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	English for academic purposes
5	Discipline code	AYaDAC 6211
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

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Methodological foundations of scientific research
5	Discipline code	MONI 5209
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

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Special electronics issues
5	Discipline code	SVE 5210
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	Physics, Circuit Engineering and Electronics
14	Post-requirements	Theory of electronics and communication systems
15	Summary of the discipline (names of topics)	Physical fundamentals of IC technology. Technological limitations of the minimum dimensions of the IC elements. Limitations related to doping processes, topological dimensions, magnitudes and magnitudes, speed of parameters and IC elements. Features of electric transfer processes in quantum-dimensional devices. Ballistic devices. Devices based on resonant tunneling, acoustic and magneto effects. Problems of creating an element base, materials science and circuit engineering. The principle of functioning and architecture of molecular circuits. Optical radiation, power and photometric characteristics. Quantum transitions occurring in semiconductors. Emitters based on heterostructure. Coherent and incoherent light devices. Photodetector devices.
16	Results of discipline training	LO5,LO7
17	The name of the Alternative Discipline for the discipline of the Component of choice	Special issues of micro, nano and optoelectronics

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Physical foundations of electronic engineering materials
5	Discipline code	FOMET 5308
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. Physics. Electrical and radio materials science. Fundamentals of micro and nanoelectronics.
14	Post-requirements	Embedded and touch devices. Modern problems of theory and microwave technology
15	Summary of the discipline (names of topics)	Materials of electronic equipment. Interatomic bonds. The structure of solids. Defects in crystals. Properties of conductors and their physical nature. The phenomenon of superconductivity. Properties of semiconductors. Proprietary and impurity semiconductors. Band theory of semiconductors. Brillouin zones. Fermi level. Generation and recombination of electrons and holes. Contact phenomena in semiconductors. Heterostructures. Superlattices. Optical and photoelectric phenomena in semiconductors. Dielectrics. Polarization of dielectrics. Losses in dielectrics. Physics of magnetic materials.
16	Results of discipline training	LO4,LO5
17	The name of the Alternative Discipline for the discipline of the Component of choice	Physics of conductors and dielectrics

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Metrological support of radio engineering systems networks
5	Discipline code	MOSRS 6307
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	Physics. Theory of electrical circuits. Mathematics.
14	Post-requirements	Digital broadcasting systems. Embedded and touch devices.
15	Summary of the discipline (names of topics)	General measurement issues in radio engineering and electronics. Properties of measuring instruments and the requirements imposed on them. Accuracy, technical characteristics of measuring instruments. Prospects for the development of measuring instruments in electronics. Measurement of radio signal spectrum parameters. Methods for measuring the standing wave coefficient by voltage, modulus and phase of the reflection coefficient. Metrological support of quality meters. Methods of phase measurement. Automated methods of phase measurement. Analyzers. Indication. Design of connecting devices.
16	Results of discipline training	LO5,LO9
17	The name of the Alternative Discipline for the discipline of the Component of choice	Metrological support of radio-electronic production

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Radio automatic systems
5	Discipline code	RS 5306
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	1
13	Prerequisites	Fundamentals of telecommunications. Radio automation and telemetry. Radio circuits and signals.
14	Post-requirements	Metrological support of radio engineering systems networks. Digital broadcasting systems. Embedded and touch devices.
15	Summary of the discipline (names of topics)	Radio automation systems. Typical radio automation systems. Automatic tracking systems for the range of moving objects. Control objects of mobile systems. Transfer functions. Transfer functions of connected links. Transformation of functional circuits of radio automation into block diagrams. Phase auto-tuning of the frequency. The time tracking system is the position of the pulse signal. The system of automatic determination of the direction of radio waves. Discrete functions and their equations and definitions.
16	Results of discipline training	LO3,LO4
17	The name of the Alternative Discipline for the discipline of the Component of choice	Automatic control systems in radio electronics

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	LPWAN for the Internet of Things
5	Discipline code	LDIV 6305
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

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	7M06205 Radio-electronic technologies and systems
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

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	7M06205 Radio-electronic technologies and systems
4	Name of the discipline	Digital broadcasting systems
5	Discipline code	CST 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	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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