Ministry of Agriculture of the Republic of Kazakhstan
NAO «Kazakh Agrotechnical Research University» named after S.Seifullin

APPROVE
«S.Seifullin Kazakh Agrotechnical
Research University» NJSC
Chairman of the Board-Rector
It is necessary to « named after »
_____ Tireuov K.M.

«24» 06 2024 y., № 16 protocol

EDUCATIONAL PROGRAM
7M06205 – «Radioelectronic technologies and systems»
(name of the program)

The code and classification of the field of education:	7M06 Information and communication technologies
The code and classification of training areas:	7M062 Telecommunications
The code in the International Standard Classification of Education:	062
Degree/qualification awarded: Bachelor / Specialist/Master/Doctor	According to the educational program 7M06205 – «Radioelectronic technologies and systems»

Astana 2024

Академический комитет по разработке образовательной программы 7М06205 – «Радиоэлектронные технологии и системы»

№	Ф. И. О.	Ученая степень, должность и организация	Подпись членов комитета и печать организации
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Члены комитета:			
2	Мухамедрахимов Кариполла Уалиевич	К.ф.-м.н., старший преподаватель, кафедра «Радиотехника, электроника и телекоммуникации» НАО «КАТИУ им. С.Сейфуллина»	
3	Ногай Адольф Сергеевич	Д.ф-м.н., профессор, кафедра «Радиотехника, электроника и телекоммуникации» НАО «КАТИУ им. С.Сейфуллина»	
4	Набиев Наби Козыевич	К.т.н., старший преподаватель, кафедра «Радиотехника, электроника и телекоммуникации» НАО «КАТИУ им. С.Сейфуллина»	
5	Темирбаев Мурат Дильбарханович	Директор департамента информационной безопасности ТОО «KAP Technology»	
6	Тукушев Нурбахыт Батырханович	Главный бизнес-аналитик Департамента Pre Sale Дивизиона по корпоративному бизнесу – филиал АО «Казахтелеком»	
7	Мяло Михаил Валерьевич	Начальник Центральной службы средств диспетчерского и технологического управления (ЦССДТУ) АО «Акмолинская распределительная электросетевая компания»	
8	Ивонин Николай Николаевич	Старший партнер по обучению и развитию/Техническая академия Дирекции «Академия инфокоммуникационных технологий» – филиал АО «Казахтелеком»	
9	Айтқұлов Нұрсұлтан Сәкенұлы	Магистрант 2 курса, кафедра «Радиотехника, электроника и телекоммуникации», группа 20-096-21-13	

The Academic Committee was approved by the order of the Chairman of the Board-Rector of «S.Seifullin KATRU» NAO №374-Н from «18» october 2023г.

Educational program 7M06205 - «Radio engineering, electronics and telecommunications»

Reviewed on:

at a meeting of the department of «Radio engineering, electronics and telecommunications» protocol
№11a from «03» 05 2024y.,
at the meeting of the Faculty Council energy faculty for academic quality, protocol
№15 from «21» 06 2024y.,
at the meeting of the Academic Council of the University, №10 от «24» 06 2024y.

Date of update «04» 08 2023 y.

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1Passport of the educational program

1.1 Objective of the educational program

Training of highly qualified masters based on the integration of education and science in the field of radio-electronic technologies and systems. The educational program forms readiness to conduct scientific research and experiments, to create service models and resources of radio-electronic technologies and systems, to master the skills of an effective system for training scientific personnel of a new formation.

The resulting learning outcomes:

TR 1 Use the state and foreign languages to the extent necessary to obtain information of professional content and to present one’s ideas and options for solving professional problems in oral and written forms.

TR 2 Plan scientific and pedagogical activities and be prepared for further independent learning.

TR 3 Be competent in managing pedagogical and professional activities, demonstrate leadership qualities, use creative thinking skills and independent research activities.

TR 4 Solve problems related to the design and operation of radio-electronic technologies and systems, perform calculations and reasonably select the necessary equipment in accordance with calculated and specified technical and economic data.

TR 5 Analyze and use intelligent methods of signal processing, metrological support and mathematical processing of measurement results.

TR 6 Assess modern issues of radio-electronic technologies and systems according to the Atlas of New Professions of the Republic of Kazakhstan. Be prepared to independently conduct research, analyze and process results in the design, development and instrument-technological modeling of elements of radio-electronic equipment using new technical solutions.

TR 7 Carry out innovative engineering projects for the development of hardware and software for radar, radio navigation and space systems using modern methods and automated design systems, and advanced experience in developing competitive products.

TR 8 Select and use knowledge of modern achievements in the field of creation, operation and development prospects of radio-electronic technologies and systems.

TR 9 To form a natural scientific worldview necessary for the full development of the individual in the social and professional spheres.

TR 10 Demonstrate competence in modern hardware for information security and their safe use in radio-electronic technologies and systems.

TR 11 Formulate theoretical and practical knowledge to solve educational, practical and professional problems in the studied area; use the principles and methods of scientific research, academic writing and apply them in the studied area; determine the meaning of the principles and culture of academic honesty.

Regulatory framework

• Constitution of the Republic of Kazakhstan.

• Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III “On Education” (as amended and supplemented as of 01.05.2023).

• Order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 28916 “On approval of state compulsory standards of higher and postgraduate education”.

• National Qualifications Framework of 16.03.2016.

• Sectoral qualifications framework “TELECOMMUNICATIONS” No. 102-XT dated July 29, 2019.

• Atlas of new professions of the Republic of Kazakhstan (https://www.enbek.kz/atlas/)

Production unit

Department of Radio Engineering, Electronics and Telecommunications

2 General characteristics of the educational program

The relevance of the educational program is determined by the need to train highly qualified engineering personnel in high-tech fields such as radio engineering and electronics.The creation of a modern, highly effective education system in Kazakhstan is one of the most important conditions for achieving the strategic goal set by the President of the Republic.The peculiarity and uniqueness of the program is the preparation of a master's student of international level not only as a specialist, but also instilling in him pedagogical and psychological knowledge and skills as a future leader. The program takes into account the interests of all interested parties in the field of educational services.

3Competency model (portrait) of a graduate

A master's student must be competent:
- in the field of scientific research methodology;
- in the field of scientific and scientific-pedagogical activity in higher educational institutions;
- in matters of modern educational technologies;
- in the implementation of scientific projects and research in the professional field;
- in ways to ensure continuous updating of knowledge, expansion of professional skills and abilities.

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

The areas of professional activity of masters include research and development aimed at creating and ensuring the functioning of radio engineering and electronic devices and systems based on the use of physical laws, electric and magnetic fields, electromagnetic oscillations and waves, and designed to control and automate technological processes, convert and amplify signals, as well as transmit, receive and process information, obtain information about the environment, natural and technical objects, as well as to influence natural or technical objects in order to change and improve their properties.

3.1 Types of professional activity

- design and engineering activities;
- production and technological;
- service and operational;
- organizational and managerial;
- installation and commissioning;
- calculation and design;
- scientific research;
- scientific and pedagogical.

3.2 General educational competencies

During the training process, the master's student acquires knowledge, skills and abilities in his future profession as a highly qualified specialist.

- the ability to improve and develop one’s intellectual level;
- the ability to independently learn new research methods, to change the scientific and scientific-industrial profile of their professional activities;
- the ability to freely use Russian and foreign languages as a means of business communication;
-the ability to use in practice skills and abilities in organizing research and design work, in managing a team;
- readiness for active communication with colleagues in scientific, industrial and social spheres of activity;
- the ability to adapt to changing conditions, re-evaluate accumulated experience, analyze one’s capabilities;

- the ability to positively influence others in terms of compliance with the norms and recommendations of a healthy lifestyle;

- willingness to use knowledge of legal and ethical standards when assessing the consequences of their professional activities, when developing and implementing socially significant projects.

3.3 Basic competencies

During the training process, the master's student acquires the following types of basic competencies - socio-political, informational, communicative, readiness for education through all work activities. As a result of acquiring the basic competencies of the educational program, the master's student must be able to:
- use basic knowledge to solve problems of modeling, designing radio engineering and electronic systems and devices, programming technological processes of their operation;
– identify the natural scientific essence of problems arising in the course of professional activity, and use relevant knowledge and basic competencies to solve them;
– use modern means for the execution and preparation of design and technological documentation;
– use basic techniques for processing and presenting experimental data;
– search, process and analyze information from various sources and databases, present it in the required format using information, computer and network technologies;
– use modern trends in the development of radio engineering and electronics, measuring and computing equipment, information technology in their professional activities;
- navigate the selection of materials, elements and electronic devices taking into account their physical and operational characteristics when designing and creating electronic systems and devices.
– use computer skills, be proficient in information technology methods, and comply with basic information security requirements.

3.4 Professional competencies

As a result of mastering the master's educational program, graduates acquire competencies that allow them to become agents of building a modern school, organizers of the professional growth system at the local level, endowed with an up-to-date set of expert, analytical and communication skills, and real leaders of the modernization of education in the country.

As a result of mastering the professional competencies of the master's educational program, the master's student must have:

- the ability to use the results of mastering the fundamental and applied disciplines of the master's educational program;
- the ability to demonstrate skills in working in research circles and teams, and generate new ideas;
- the ability to organize and conduct experimental research using modern means and methods;
- the ability to understand the main problems in their subject area, choose methods and means for solving them;
- the ability to independently acquire and use new knowledge and skills in practical activities, including in related fields of knowledge, as well as in new areas not directly related to the field of activity;
- the ability to professionally operate modern equipment, devices and instruments (in accordance with the objectives of the master's program);
- the ability to study and understand the operating principles of radio engineering and electronic devices for various purposes and carry out commissioning, operational, preventive and repair work.
- the ability to formalize, present and report the results of the work performed.
- the ability to conduct laboratory and practical classes with students, supervise course design and the completion of final qualifying theses for bachelors;
- the ability to develop teaching and methodological materials for students for specific types of educational activities.

4Base for professional practice

According to the educational program "Radioelectronic Technologies and Systems", master's students undergo research and teaching practices, which are a mandatory section of the program. Professional practice (research and teaching) involves consolidating theoretical knowledge obtained during the training process, acquiring practical skills and competencies, and mastering advanced experience. Professional practice is aimed at gaining experience in solving real engineering problems or studying current scientific problems. During the practice, the master's student collects material for a master's thesis/project or scientific/experimental research work related to solving current problems determined by the educational program. The content of the practice is determined by the topic of the final qualifying work.

Research and production internships are planned to be carried out in large scientific, technological and design departments of enterprises, information and computing centers or at the graduation department.

The bases for research/industrial practice are organizations corresponding to the profile of the specialty being studied (or related organizations):

- JSC "Nursultan Nazarbayev International Airport"
- Branches of Transtelecom JSC
- Public Organization "Kazakhstan Federation of Radio Sports and Amateur Radio", Astana
- LLP "Ulttyk Telecom", Astana
- Branches of JSC Kazakhtelecom, RK
- JSC "Astana-Regional Electric Grid Company", Astana
- JSC NC Kazakhstan Temir Zholy, Astana
- LLP “Digital system service”, Astana
- LLP "HalykTelecom" Astana
- Sputnik Service 2007 LLP, Astana
- JSC NC KTZ GCUS, Astana
- Branch of JSC "Industrial Construction Telephone Company "Bitelecom" - Akmola PMK communications"
- JSC Astel, Astana
- JSC Energoinform, Astana
- Central Asia Telecom LLP, Astana
- MBit LLP, Astana
- RTRC "Kazakhstan", Astana
- KazMedia Center LLP, Astana
- "Allem" Engineering Company LLP, Astana
- JSC "Kazteleradio", Astana
- JSC "Kazinformtelecom", Astana
- JSC "Alma-TV", Astana

5 Structure of the educational program

Item No.	Name of the cycles of disciplines and types of activities	Total labor intensity	
		in academic hours	in academic credits
1	2	3	4
1	**Theoretical training**	**2640**	**88**
1.1	**Cycle of basic disciplines (BD)**	**1050**	**35**
1)	University component (UC)	600	20
	History and philosophy of science	150	5
	Pedagogy of Higher Education	90	3
	Foreign language (professional)	150	5
	Psychology of Management	150	5
	Teaching practice	60	2
2)	Component of Choice (CC)	450	15
	Physical principles of materials for electronic engineering	150	5
	Physics of conductors and dielectrics	150	
	Specialized electronics issues	150	5
	Special issues of micro, nano and optoelectronics	150	
	Methodological foundations of scientific research	150	5
	Theory and practice of technical experiment	150	
1.2	**Cycle of major disciplines (MD)**	**1590**	**53**
1)	University component (UC)	1200	40
	Modern problems of the theory of microwave technology	150	5
	Intelligent methods of signal processing	150	5
	Research practice	330	11
	Instrumentation and technological modeling in electronics	150	5
	Digital TV and Radio Broadcasting Systems	150	5
	Methods of ensuring electromagnetic compatibility of radio-electronic equipment	150	5
	Embedded and touch devices	120	4
2)	Component of Choice (CC)	390	13
	Radio automatic systems	120	4
	Automatic control systems in radio electronics	120	
	Metrological support of radio engineering systems networks	150	5
	Metrological support of radio-electronic production	150	
	Academic writing	120	4
	English for Academic Purposes	120	
2	**Research work**	**720**	**24**
1)	Research work of a master's student, including an internship and the completion of a master's thesis (RWMS)	720	24
3	Additional types of education (ATE)		
4	**Final certification**	**240**	**8**
1)	Preparation and defense of a master's thesis	240	8
	Total	**3600**	**120**

Appendix 1 Academic Calendar

Appendix 1 to the Academic Calendar
Approved by the Academic Council of the NJSC "S.Seifullin KATIUS", Protocol №12, of 28.03.2024 y.

Schedule of the educational process for the 2024-2025 academic year for the educational program Energy faculty
MASTER

Courses	September					October					November				December				January					February				Mart				April				May					June				July					August			
	26	2	9	16	23	30	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28	4	11	18	25
	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	31	7	14	21	28	7	14	21	28	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
7M07103 - "Electricity networks", 7M07104 - "Power supply of industrial enterprises cities and agro industrial complexes" (Scientific & pedagogical direction)																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/TD/RP	RP/S	RP/S	H/S	H/S	H/S	H/S	H	H	H	H	H	H	H
II	H	/U	/U	/U	/U	/U	/U	/U	/U/TP	/U/TP	/U	/U	/U/RP	/U/RP	/U/RP	/U/RP	E/P	E/P	H	H	H	H	U/RP	U/RP	U/RP	U/RP	U	U	U	U	U	U	U	U	U	U	U	U	FE	FE	FE	FE	FE	FE									
7M07114 -"Power supply of industrial enterprises cities and agro industrial complexes", winter reception																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/TD/RP	RP/S	RP/S	H/S	H/S	H/S	H/S	H	H	H	H	H	H	H
II	H	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/RP	/U/RP	/U/RP	/U/RP	E/P	E/P	H	H	H	H	U/RP	U/RP	U/RP	U/RP	U	U	U	U	U	U	U	U	U	U	U	U	FE	FE	FE	FE	FE	FE									
7M07101 - "Thermal Engineering", 7M07102-"Heat and gas supply, ventilation and eco-engineering in agriculture "																																																				
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/H	H	H	H	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/TD/H	D/H/	S/H	S/H	S/H	S/H	S/H	H	H	H	H	H	H	H
II	H	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/H	H	H	H	U/TP	U/TP	U/EP	U/EP	U/EP	U/EP	U/EP	U/EP	U/EP	U/EP	U/EP	U	U	U	U	U	FE	FE	FE	FE	FE	FE									
7M07102-"Heat and gas supply, ventilation and eco-engineering in agriculture " , winter reception																																																					
I																			H	H	H	H	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/TD/H	H/S	H/S	H/S	H/S	H/S	H/S	H	H	H	H	H	H	H
7M06204 - "Multiservice Telecommunication Technologies "																																																						
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U/TP	/U/TP	/U/TP	/U/TP	/U	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	E/P	E/P	P/TD/H	H/S	H/S	H/S	H/S	H/S	H/S	H	H	H	H	H	H	H
7M06204 - "Multiservice Telecommunication Technologies ", winter reception																																																					
I-II	H	/U	/U	/U/TP	/U/TP	/U	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	E/P	E/P	H	H	H	H	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U	/U	/U	E/P	E/P	P/TD/H	H/S	H/S	H/S	H/S	H/S	H/S	H	H	H	H	H	H	H
7M06205 - "Radio-electronic technologies and systems "																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U/TP	/U/TP	/U/TP	/U/TP	/U	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U	/U	E/P	FE	FE	FE	FE	FE	FE									
7M07105 - "Control of technical systems"																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U	/U/TP	/U/TP	/U/TP	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	P/TD/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	RP	RP	RP	RP
II	RP	/RP/U	/RP/U	/RP/U	/RP/U	/RP/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	FE	FE	FE	FE	FE	FE									
7M08705 - "Energy supply and automation of agriculture"																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U	/U/TP	/U/TP	/U	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U/RP	/U	/U	/U	/U	/U	E/P	E/P	P/TD/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	RP	RP	RP	RP
II	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	U/RP	E/P	FE	FE	FE	FE	FE	FE									
7M07105 - "Control of technical systems", winter reception																																																					
I	PW	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	/U	E/P	E/P	H	H	H	H	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	/U/TP	E/P	E/P	P/TD/H	S/H	S/H	S/H	S/H	S/H	S/H	H	H	H	RP	RP	RP	RP

Conventional signs

Presentation week	Theoretical training	Enrollment in disciplines	Examination session	Passing FX	Holidays	Summer semester	Final examination	Teaching practice	Educational practice	Industrial practice	Undergraduate practice
PW	•	TD	E	P	H	S	FE	TP	EP	IP	U

Public holidays

Director of the Institute of Postgraduate Education — Husainova Zhibek Seitovna

Dean of the Faculty Energy — Isenov Sultanbek Sansyzbayevich

The Ministry of Agriculture of the Republic of Kazakhstan

NC JSC "S.Seifullin Kazakh Agrotechnical Research University"

Considered at the meeting
of Academic Council
of the University

Protocol № 10
"26" 06 2024 y.

APPROVED
Member of the Board
Vice-Rector for Research and
innovation activities
NC JSC "KATIU"
Syrgaliev E.O.
___ 2024 y.

CURRICULUM

for 2024-2026 academic year
For the modular education program 7M06205 Radio-electronic technologies and systems
by the speciality/group of educational programmes M096 – Communications and communication technologies
Degree: Master's program by specialization (Scientific & pedagogical direction)
Form of education: Full-time (MS 2 years) semester
Entry year: 01-09-2024 (summer reception)

Module code	Module name	Discipline cycle	Discipline component	Code of subject	Subject name	Academic credits	Control in the academic period: Exams	Differentiated test(practice)	Differentiated test(course paper)	Practice/SRW	Term paper/project	Volume of hours: Total	In-class learning	including: Lectures	Practice	Lab practicals	MSIWT	MSIW	Distribution of credits per academic period: 1 course, 1	1 course, 2	2 course, 3	2 course, 4
																			Number of weeks in the academic period			
																			15	15	15	15
General modules																						
1	Professional practice	BS	UC	PP 5205	Pedagogical training	2				60		60.0		0	0	0	0	0		2.0		
Modules of specialty/education programm																						
2	Proffesional practice	AS	UC	IP 5315	Research practice	5				150		150.0		0	0	0	0	'0		5.0		
3		AS	UC	IP 6316	Research practice	6				180		180.0		0	0	0	0	0			6.0	
4	Research and pedagogical	BS	UC	IYaP 5202	Foreign language (professional).	5	1					150.0	45.0	0	45	0	20	85	5.0			
5		BS	UC	PU 5204	Psychology of management	5	2					150.0	45.0	15	30	0	20	85		5.0		
6		BS	UC	PVSH 5203	Pedagogics of higher school	3	2					90.0	30.0	15	15	0	12	48		3.0		
7		BS	UC	IFN 5201	History and philosophy of science	5	2					150.0	45.0	15	30	0	20	85		5.0		
8		AS	ES	AYaDAC 6317	English for Academic Purposes	4	3					120.0	45.0	0	45	0	16	59			4.0	
9				AP 6314	Academic writing.		3						45.0	0	45	0	16	59				
10		BS	ES	TPTE 5212	Theory and practice of technical experiment	5	2					150.0	45.0	15	30	0	20	85		5.0		
11				MONI 5209	Methodological bases of scientific research		2						45.0	15	30	0	20	85				

12	-	AS	UC	SPTSST 5302	Modern problems of the theory of microwave technology	5	1					150.0	45.0	15	15	15	20	85	5.0			
13		AS	UC	IMOS 5310	Intelligent signal processing methods	5	1					150.0	45.0	15	0	30	20	85	5.0			
14		AS	UC	PTME 6301	Instrument-technological modeling in electronics	5	3					150.0	45.0	15	30	0	20	85			5.0	
15		AS	UC	VSU 6303	Embedded and touch devices	4	4					120.0	45.0	15	0	30	16	59				4.0
16		AS	UC	MOESRS 6312	Methods of provision of the electromagnetic compatibility of radio electronic equipment	5	4					150.0	45.0	15	30	0	20	85				5.0
17		AS	UC	CST 6311	Digital broadcasting systems	5	4					150.0	45.0	15	30	0	20	85				5.0
18	Electronics	BS	ES	FOMET 5215	Physical bases of materials for electronic engineering	5	1					150.0	45.0	15	15	15	20	85	5.0			
19				FPD 5216	Physics of conductors and dielectrics		1						45.0	15	15	15	20	85				
20		AS	ES	MOSRS 6307	Metrological provision of networks of radio systems	5	3					150.0	45.0	15	30	0	20	85			5.0	
21				MORP 6313	Metrological support of radio-electronic production		3						45.0	15	30	0	20	85				
22		AS	ES	RS 5306	Radioautomatic systems	4	1					120.0	45.0	15	15	15	16	59	4.0			
23				ASUR 5313	Automatic control systems in radio electronics		1						45.0	15	15	15	16	59				
24		BS	ES	SVMNO 5217	Special issues of micro, nano and optoelectronics	5	1					150.0	45.0	15	15	15	20	85	5.0			
25				SVE 5210	Special Issues of electronics		1						45.0	15	15	15	20	85				
					Scientifically research																	
26	SRWM	RW	CS	NIRMVPSVMD 5501	Master's research work, including internship and master's thesis	1				30		30.0		0	0	0	0	0	1.0			
27		RW	CS	NIRMVPSVMD 5514	Master's research work, including internship and master's thesis	5				150		150.0		0	0	0	0	0		5.0		
28		RW	CS	NIRMVPSVMD 6515	Master's research work, including internship and master's thesis	10				300		300.0		0	0	0	0	0			10.0	
29		RW	CS	NIRMVPSVMD 6516	Master's research work, including internship and master's thesis	8				240		240.0		0	0	0	0	0				8.0
1					**General education subjects(GER)**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
					Core subjects(GER/CS)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					University component(GER/UC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					Electives(GER/ES)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2					**Base requirements(BS)**	**35**		**0**	**0**	**60**	**0**	**1050**	**300**	**90**	**180**	**30**	**132**	**558**	**15**	**20**	**0**	**0**
					Core subjects(BS/CS)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					University component(BS/UC)	20		0	0	60	0	600	165	45	120	0	72	303	5	15	0	0
					Electives(BS/ES)	15		0	0	0	0	450	135	45	60	30	60	255	10	5	0	0
3					**Profession requirements(VRS)**	**53**		**0**	**0**	**330**	**0**	**1590**	**405**	**120**	**195**	**90**	**168**	**687**	**14**	**5**	**20**	**14**
					Core subjects(VRS/CS)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					University component(VRS/UC)	40		0	0	330	0	1200	270	90	105	75	116	484	10	5	11	14
					Electives(VRS/ES)	13		0	0	0	0	390	135	30	90	15	52	203	4	0	9	0
Total of theoretical course						112	16	0	0	1110	0	3360	705	210	375	120	300	1245	30.0	30.0	30.0	22.0
A	**Additional courses**															0						
FA	**Final attestation**					8									240.0							

	Of the Master's thesis	8				4		240										
	Total	120				1114		3600	705	210	375	120	300	1245				

Examinations (semester)* - The final form of control on Physical Culture and types of professional practice is a differentiated credit.

The modular curriculum is made in accordance with the standard curriculum of the speciality (approved by the Order of the MES RK from 16.08.2013 № 343).

State obligatory standards of education (approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan from 23.08.2012 № 1080), modular educational programme of the specialty.

The modular curriculum was considered and approved at the meeting of the methodical commission of the faculty. Protocol № 20__

Director of Department of Academic Affairs KHUSSAINOVA ZHIBEK SEITOVNA

Dean of the Faculty of Energy Issenov Sultanbek Sansyzbaevich

Head of the Department Dunayev Pavel Alexandrovich

Appendix 3 Description of the disciplines of the BD cycle

№	Наименование дисциплины	Краткое описание	Кол-во кредитов	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
Цикл базовых дисциплин (БД) Вузовский компонент														
1	History and philosophy of science	Forms the skills of the methodological and dialectical approach to the research, summarizes philosophical knowledge, studies the issues of historical development, its structure, analyzes the patterns and trends of scientific knowledge, systematizes the effectiveness of research work.	5		+							+		
2	Pedagogics of higher school	It allows undergraduates studying in the scientific and pedagogical direction to understand common problems, methodological and theoretical foundations of Higher School pedagogy, skills of analysis of teaching and upbringing, elements of modern planning and organization technologies.	3		+	+								
3	Foreign language (professional)	It forms foreign language competence as a significant component of professional competence, a culture of scientific speech that allows one to integrate into international scientific activity, allows one to operate with a scientific and conceptual apparatus, expand the scientific information base, and identify promising areas of professional and scientific activity.	5	+										
4	Psychology of management	Forming the skills of managing organized activities of people through the study of psychological laws and patterns of management and quality of work, developing the ability to make decisions scientifically, planning the activities of other people, and managing into an organization.	5			+								

5	Pedagogical practice	Pedagogical practice is aimed at acquiring professional competencies in the field of teaching, consolidating and deepening the theoretical knowledge gained in pedagogy and teaching methods obtained in the learning process by deepening the skill of planning, organizing and conducting practical training sessions.	2		+	+								
Цикл базовых дисциплин (БД) **Компонент по выбору**														
6	Physical bases of materials for electronic engineering	Forms basic knowledge of the physical foundations of materials of electronic technology according to the content of the discipline. Interatomic bonds. Defects in crystals. Properties of conductors and their physical nature. The phenomenon of superconductivity. Properties of semiconductors. Zone theory of semiconductors. Fermi level. Heterostructures. Dielectrics. Physics of magnetic materials.	5				+				+			
7	Physics of conductors and dielectrics	Forms basic knowledge of the physics of conductors and dielectrics according to the content of the discipline. The most important properties of crystals. Bravais gratings. Types of communication in materials. Classical Drude-Lorentz theory. Matthiessen's rule. conductor resistance. Physical processes in semiconductors. Photoconductivity. Dielectrics. Mechanisms of polarization. Liquid crystals.	5				+				+			
8	SpecialIssuesofelectronics	The content of the discipline allows you to study in depth the special issues of electronics, the basics and features of IC technology. Features of electrotransport processes in quantum-sized devices. The principle of functioning and architecture of molecular schemes. quantum transitions. Heterostructure-based emitters.	5				+		+					

9	Special issues of micro, nano and optoelectronics	The content of the discipline allows you to study in depth the special issues of micro, nano and optoelectronics, the basics and features of these technologies. Physical foundations of IC technology. Physical limitations of topological dimensions, degree and density of integration, speed and parameters of IC elements. Molecular electronics.	5				+		+					
10	Methodological bases of scientific research	Allows you to form knowledge about the main stages of scientific research. Review of the main directions of development of scientific research. Methodology and methodology of scientific research. Processing of the results of experimental studies. Implementation and effectiveness of scientific research. Basic principles of study group management.	5						+					+
11	Theory and practice of technical experiment	Allows you to form knowledge about the main stages of conducting experiments and processing their results. Basic provisions and concepts of probability theory and mathematical statistics. Theory of random errors. Processing of experimental data of measurement results. Methods for graphical processing of measurement results.	5						+					+
Цикл профилирующих дисциплин (ПД) **Вузовский компонент**														
12	Modern problems of the theory of microwave technology	Forms knowledge in the field of microwave propagation, radiation and reception devices. Theory of retarding systems. The device and principle of operation of transient and reflective klystrons. The device and principle of operation of traveling and reverse wave lamps. Gunn Diode. Avalanche transit diodes, generators and amplifiers based on them.	5						+		+			

13	Intelligent signal processing methods	The purpose of the disciplines is to gain knowledge about the methods of intelligent signal processing and vision systems. Artificial neuron model. Neural network model. Learning algorithms. Recurrent, spike networks and others. Implementation of ANN on FPGA, generation of Neural Network Verilog code. Signal preprocessing.	5							+		+		

Appendix 4 Description of disciplines of the PD cycle

№	Наименование дисциплины	Краткое описание	Кол-во кредитов	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
1	Research practice	The research practice of undergraduates is conducted in order to collect, analyze and generalize scientific material, develop original scientific ideas for the preparation of a master's thesis, gain skills for independent research work, practical participation in research work of research teams.	11		+				+					
2	Instrument-technological modeling in electronics	The content of the discipline allows you to form knowledge and skills in modeling physical processes and electronics elements. Technology of semiconductor devices. Modeling Methods for constructing physical and mathematical models of semiconductor devices. Mathematical models of diode and transistor. Programs for mathematical modeling of technological processes.	5						+					
3	Digital broadcasting systems	The discipline forms knowledge about digital television and radio broadcasting systems, methods of modulation, transmission and reception of these signal types. Television systems of high quality and high definition, transmission of additional information, opto-electronic and electro-optical conversion devices, transmission and distribution of digital television and radio broadcasting signals.	5				+							
4	Methods of ensuring electromagnetic compatibility of radio-electronic means	The course is aimed at gaining knowledge about the methods of ensuring the electromagnetic compatibility of radio-electronic means, the methods of its calculation and the impact on objects. EMC prediction. Sources and receptors of electromagnetic interference. Balance	5						+				+	

		equation between noise. Information measure of control - divergence of two signals.												
5	Embedded and touch devices	Knowledge about the principles of operation and production technologies of embedded and sensory devices is being formed. Cyber-physical approach. Embedded device architecture. Organization of the interface and input-output systems in embedded devices and systems. Operating modes. OS. Embedded systems security. Typical application of embedded and touch devices.	4						+		+			
Цикл профилирующих дисциплин (ПД) **Компонент по выбору**														
6	Radioautomatic systems	The goal is to study the basic principles of building various radio automatic systems. Typical systems of radio automatics are considered. Systems for automatic tracking of the range of objects. transfer functions. Pulse signal time tracking system. System for automatic determination of the direction of radio waves.	4				+			+				
7	Automatic control systems in radio electronics	The goal is to study the basic principles of building various auto control systems in radio electronics, typical tools used to organize these systems. Classification of control systems in radio electronics. Methods of analysis and synthesis of digital control systems. Mathematical description of automatic systems. Typical links and their characteristics.	4				+			+				
8	Metrological provision of networks of radio systems	The discipline is aimed at studying the main tasks of metrological support for networks of radio engineering systems. Properties of measuring instruments and requirements for them. Measurement of radio signal parameters. Methods for measuring the standing wave	5					+	+					

		coefficient, the modulus and phase of the reflection coefficient, the quality factor.												
9	Metrological support of radio-electronic production	The discipline is aimed at studying the main tasks of metrological support, the tasks of metrological support solved by specialists at the stages of the product life cycle. Scientific, organizational, technical and regulatory framework for metrological support. Directions of activity of metrological services. Metrological control of technical documentation.	5					+	+					
10	Academic writing.	The course aims to develop and improve the academic skills in written English required for successful written communication in academic, professional and work settings. The practice of writing a discursive essay: plan, main idea, paragraphs and conclusion. Methods of paraphrasing, references and citation. abbreviations, academic vocabulary, use of articles.	2	+										+
24	English for Academic Purposes	Comprehensive theoretical-linguistic, practical and information-analytical training in order to perform functions related to the use of a foreign language in professional and scientific activities: possession of public speaking skills, discussion, the ability to work with information from various sources, edit professional texts in a foreign language.	2	+										+