

Module Reference Book

Radio Engineering, Electronics and Telecommunications (Ba)

Table of Contents

Basic Modules (all courses of the module are compulsory for learning)	3
Module 1: Physics	3
Module 2: Basics of Mathematics	4
Module 3: History of the State	6
Module 4: Foreign Language	7
Module 5: National Language	9
Module 6: Recreation Classes (Beginner Level)	11
Module 7: Basics of Electrical Engineering	12
Module 8: Information and Communication Technologies	14
Module 9: Philosophy	16
Module 10: Recreation Classes (Intermediate Level)	17
Module 11: Design of Electronic Devices	18
Module 12: Digital Control Systems	20
Module 13: Receiving and Transmitting Devices	22
Module 14: Radio Engineering Systems	25
Module 15: Profound Language Learning	27
Module 16: Social and Humanitarian Knowledge	29
Module 17: Final Internship	31
Module 18: Final Academic Assessment	33
Elective Modules (containing elective courses)	35
Module 19: Basics of the Profession	35
Module 20: Analysis and synthesis of electrical circuits	39
Module 21: Technologies of Technogenic Risk Management	45
Module 22: Modules of modern electronic equipment	47
Module 23: Design of electronics, control and communication systems	51
Module 24: Modern Communication Systems	56

Module Name:	Module 1: Physics
Code	M1REET(Ba)
Module Elements:	<i>Compulsory Subjects</i> Physics
Semester Number:	2
Person responsible for the module	P.I. Leontyev
Lecturer:	<i>Physics</i> – P.I. Leontyev
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	2 semester: hours per week – 12 (lectures -1; workshops -1; labs-2; independent work -8); hours per semester – 180.
Workload:	Teaching Load: 60 hours Extracurricular Classes: 120 hours Total: 180 hours
Credit Points:	6 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained by students in high school during the course of Physics
Expected Learning Outcomes:	Know the basic physical phenomena and laws of classical and modern physics. Be able to apply physical phenomena, laws and modern methods for solving applied problems. Possess the skills to solve engineering problems using the laws of physics. Demonstrate the ability to conduct a physical experiment, work with measuring instruments, calculation and processing of the data.
Intendend use/applicability	Modules: Basics of Electrical Engineering, Analysis and synthesis of electrical circuits, Design of Electronic Devices, Digital Control Systems, Receiving and Transmitting Devices
Content:	Mechanics. Molecular physics. Thermodynamics. Electricity and Magnetism. Optics. Elements of Atom Physics and Nuclear Physics.
Examination Form, module mark:	<i>Physics</i> – computer-based testing Module mark: the result of the exam <i>Physics</i>
Technical/Multimedia Facilities:	Multimedia system, laboratories of Mechanics, Optics and Power Energy. IT room with Internet access, internal educational network of the University.
Study Materials:	1. T.I. Trofimova. Course of Physics. – Moscow, 2003. 2. A. A. Detlaf, B. M. Yavorsky. Course of Physics. – M: 2009. 3. L. A. Dyachenko, I. I. Golovaschenko Collection of Tests on. Petropavlovsk, 2009. 4. I. V. Savelyev. Course of General Physics. SPb.: Lan, 2006. 5. T. I. Trofimova. Collection of Problems for the Course of General Physics, – Moscow, 2004. 6. T. M. Trofimova. Basics of Physics.: – Moscow, 2007. 7. P.I. Leontyev, L. A. Dyachenko. Collection of Tests on Physics 1, Petropavlovsk: NKSU, 2010. 8. L. A. Dyachenko. Laboratory Pracrice Course for Technical Professions, Petropavlovsk: NKSU, 2009
Date of last amendment	20.01.2023

Module Name:	Module 2: Basics of Mathematics
Code	M2REET(Ba)
Module Elements:	<i>Compulsory Subjects</i> Mathematics 1 Mathematics 2
Semester Number:	1, 2
Person responsible for the module	M.S. Akhmetzhanov
Lecturer:	Mathematics 1, Mathematics 2 – M.S. Akhmetzhanov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 6 (lectures -1; workshops -2; independent work -3); hours per semester – 90. 2 semester: hours per week – 8 (lectures -1; workshops -1; labs-1; independent work -5); hours per semester – 120.
Workload:	Teaching Load: 90 hours Extracurricular Classes: 120 hours Total: 210 hours
Credit Points:	7 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained by students in high school in the courses of Algebra and Pre-calculus, and Geometry
Expected Learning Outcomes:	Know the course of Higher Mathematics. Be able to apply modern mathematical methods to solve applied problems. Possess the skills to solve engineering problems using mathematical methods. Demonstrate the ability to perform calculations and justification of technical solutions adopted during the development.
Intendend use/applicability	Modules: Basics of Electrical Engineering, Analysis and synthesis of electrical circuits, Design of Electronic Devices, Digital Control Systems, Receiving and Transmitting Devices
Content:	<i>Mathematics 1</i> Elements of linear algebra and analytic geometry. Introduction to mathematical analysis. Differential and integral calculus of a function of one variable and its applications. <i>Mathematics 2</i> Differential calculus of a function of many variables. Multiple integrals and their applications. Theory of series. Differential equations. Elements of probability theory and mathematical statistics.
Examination Form, module mark:	Comprehensive examination including: <i>Mathematics 1</i> – written examination <i>Mathematics 2</i> – computer-based testing Module mark: the result of the exam <i>Mathematics 2</i>
Technical/Multimedia Facilities:	Multimedia system, IT room with Internet access, internal educational network of the University
Study Materials:	1. D. T. Pismenniy. Abstract of Lectures on Higher Mathematics. M.: Ayris Press, 2004 2. K. I. Lungu, D. T. Pismenniy. Collection of Tests in Higher Mathematics. M. Ayris Press, 2001. 3. P. Y. Danko, A. G. Popov. Higher Mathematics in Exercises and Problems. M: Vysshaya Shkola, 2006.

	4. Y. S. Bugrov, S. M. Nikolskiy. Elements of Linear Algebra and Analytic Geometry. M. Nauka. 2008.
Date of last amendment	20.01.2023

Module Name:	Module 3: History of the State
Code	M3REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Modern History of Kazakhstan
Semester Number:	1
Person responsible for the module	A.A. Pleshakov
Lecturer:	Modern History of Kazakhstan – A.A. Pleshakov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 8 (lectures -2; workshops -2; independent work -4); hours per semester – 120.
Workload:	Teaching Load: 60 hours Extracurricular Classes: 60 hours Total: 120 hours
Credit Points:	4 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject
Recommended Conditions:	The discipline is based on the knowledge and skills of students obtained in the school in the following disciplines: History of Kazakhstan, World History, People and Society, World Art, Literature.
Expected Learning Outcomes:	Know: the main stages of the history of Kazakhstan in the context of world history. Be able to: distinguish scientific and not scientific views on historical processes. Possess the skills: to work with historical sources of information; to analyze the situation of conflict of interest and moral choice. Demonstrate the ability to: professionally understand the social, cultural and political conditions of the modern world.
Intendend use/applicability	Module: Philosophy
Content:	<i>Modern History of Kazakhstan</i> The study of the history of Kazakhstan as the original and at the same time as an integral part of world history; to reveal the role and place of the Kazakh people in the world community at various stages of formation and development; to show the main regularities of ethno-genetic processes on the territory of Kazakhstan; to consider features of development of socio-economic relations and the key problems of the political history; to trace the evolution of material and spiritual culture.
Examination Form, module mark:	<i>Modern History of Kazakhstan</i> - computer-based testing Module mark: the result of the exam <i>Modern History of Kazakhstan</i>
Technical/Multimedia Facilities:	Portable and stationary multimedia systems.
Study Materials:	1. History of Kazakhstan. Essay. - A. 2003. 2. S. G. Sheretov. Recent History of Kazakhstan (1985-2002). – A. 2009. 3. History of Kazakhstan: Peoples and Cultures: Text Book / N. E. Masanov et al. - A., 2001. 4. History of Kazakhstan and Central Asia: Text Book / M. K. Abuseitova et al. - A., 2001. 5. History of Kazakhstan. In 5 books. - A., 1996-2011.
Date of last amendment	20.01.2023

Module Name:	Module 4: Foreign Language
Code	M4REET(Ba)
Module Elements:	<i>Compulsory Subject</i> English (German) Language
Semester Number:	1, 2
Person responsible for the module	I.A. Olkova
Lecturer:	English (German) Language - I.A. Olkova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 12 (workshops -4; independent work -8); hours per semester – 180. 2 semester: hours per week – 6 (workshops -2; independent work -4); hours per semester – 90.
Workload:	Teaching Load: 90 hours Extracurricular Classes: 180 hours Total: 270 hours
Credit Points:	9 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	Minimal sufficient level of foreign language proficiency, which students receive in secondary school.
Expected Learning Outcomes:	Know: basic grammar and vocabulary required for reading and translating (with a dictionary) of texts in a foreign language; basic spelling rules; main parts of speech; structure of a simple and a complex sentence. Be able to: communicate (orally and in writing) in a foreign language on everyday topics; build simple and complex sentences; comprehend messages of a domestic or informational nature. Possess the skills: to improve own speaking and written speech, vocabulary; reading, monologue speech within the study topics; translation of the text in accordance with language norms. Demonstrate the ability to: build a monologue and a dialogue; reasoned presentation of own point of view in interpersonal communication in a foreign language; extract the necessary information from the authentic text in a foreign language; fill in most personal and business forms (questionnaires, CV).
Intendend use/applicability	Modules: Profound Language Learning, Information and Communication Technologies
Content:	<i>English (German) Language</i> Vocabulary: - Social and Domestic Communication: Family in modern society, Housing and accommodation; - Social and Cultural Communication: Kazakhstan, Country studies (English speaking countries: culture, geography, economy), Leisure, Traveling; - Educational and Professional Communication: Education, My University, Jobs and Professions, My future profession, Professional competence, Advantages and disadvantages of different professions; - Social and Cultural Communication: Health and Healthy Life Style, Law, Human Rights, Environment and

	<p>environmental problems, Mass Media</p> <p>Grammar:</p> <ul style="list-style-type: none"> - Tenses (Present, Past, Future – Simple, Continuous, Perfect); - Conditional sentences; - Reflexive, Possessive and Relative Pronouns; - Passive Voice; - Modal verbs (might, could, might, can); - Reported Speech; - Connectors (although, however, thus...); - Quantifiers (a few, a little etc.); - Adverbs of frequency; - Degrees of comparison (adjectives and adverbs)
Examination Form, module mark:	<p>Comprehensive examination including:</p> <p><i>English (German) Language (1 semester)</i> – written examination</p> <p><i>English (German) Language (2 semester)</i> - computer-based testing</p> <p>Module mark: the result of the exam <i>English (German) Language (2 semester)</i></p>
Technical/Multimedia Facilities:	Multimedia language laboratory, interactive whiteboard, multimedia system
Study Materials:	<ol style="list-style-type: none"> 1. Sue Kay & Vaughan Jones. Inside Out - Elementary: Macmillan, 2003. 2. Luke Prodromou. Rising Star – An Intermediate Course: Macmillan, 2001. 3. Raymond Murphy. English Grammar in Use: Cambridge University Press, 2004. 4. Simon Clarke. Macmillan English Grammar in Context: Macmillan, 2008. 5. I. Agabekyan, P. Kovalenko. English for Engineers. - 4th ed., Rostov-on-Don: Phoenix, 2006. 6. G. E. Vyborova, K. S. Makhmuryan, O. P. Melchina. Easy English: Basic course: M.: AST-Press Kniga, 2005.
Date of last amendment	20.01.2023

Module Name:	Module 5: National Language
Code	M5REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Kazakh Language
Semester Number:	1, 2
Person responsible for the module	D.K. Kuandykova
Lecturer:	Kazakh Language - D.K. Kuandykova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 12 (workshops -4; independent work -8); hours per semester – 180. 2 semester: hours per week – 6 (workshops -2; independent work -4); hours per semester – 90.
Workload:	Teaching Load: 90 hours Extracurricular Classes: 180 hours Total: 270 hours
Credit Points:	9 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	Minimal sufficient level of proficiency in the state language, which students receive in secondary school
Expected Learning Outcomes:	Know: basic concepts of speech culture (literary language, language norm, language variants); principles of speech communication; orthoepic, lexical, grammatical and stylistic norms of the Kazakh literary language. Be able to: build oral and written statements in accordance with the norms of the Kazakh literary language, logically substantiate the stated provisions; competently conduct business correspondence; use dictionaries and reference literature on the Kazakh language; use the language to establish interpersonal relations in a professional environment. Possess the skills: to improve their own oral and written speech, vocabulary; reading, monologue speech within the study topics; translation of the text in accordance with language norms. Demonstrate ability: proficiency in linguistic apparatus and basic communication skills necessary for successful professional performance
Intendend use/applicability	Module: Profound Language Learning
Content:	<i>Kazakh Language</i> Man and society. North Kazakhstan State University named after M. Kozybayev. Food is the basis of a man. Cleanliness is the basis of health, Health is the basis of wealth. Modern clothing samples. Native land. Our city is Petropavlovsk. Man and Nature. Journey. Historical sights. Art and culture. Famous people. Historical figures. My country is Kazakhstan. Education system of Kazakhstan. Society and youth. Man and law.
Examination Form, module mark:	Comprehensive examination including: <i>Kazakh Language (1 semester)</i> – written examination <i>Kazakh Language (2 semester)</i> - computer-based testing Module mark: the result of the exam <i>Kazakh Language (2 semester)</i>

Technical/Multimedia Facilities:	Multimedia language laboratory, interactive whiteboard, multimedia system
Study Materials:	<ol style="list-style-type: none"> 1. A. Aldasheva, Z. Akhmetzhanova, K. Kadasheva, E. Suleymenova. Official papers. "Sosdik-Slovar" A., 2002 2. Z. Akhmetzhanova, Z. Yernazarova. Business Kazakh Language. Basic level. Almaty: Arkhisema Publishing House, 2007 3. A. Bekturova, S. Bekturov. Kazakh Language for Everyone. Almaty: Atamura, 2004 4. Paper Work in the Republic of Kazakhstan. Almaty, 2005 5. M. Pirimbetova. Record Keeping in the Kazakh Language. Textbook. Astana, 2007 6. A. Kokanbayev, K. Musabekov, K. Ashimuly. Russian-Kazakh and Kazakh-Russian Dictionary of Petrochemical Terms and Phrases. Almaty, 2007 7. R. Kudaybergenov. Dictionary of Technical Terms. Almaty, 2009
Date of last amendment	20.01.2023

Module Name:	Module 6: Recreation Classes (Beginner Level)
Code	M6REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Physical Education
Semester Number:	1, 2
Person responsible for the module	A.A. Shitov
Lecturer:	Physical Education - A.A. Shitov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week –4 (workshops -1; independent work -3); hours per semester – 60. 2 semester: hours per week – 4 (workshops -1; independent work -3); hours per semester – 60.
Workload:	Teaching Load: 30 hours Extracurricular Classes: 90 hours Total: 120 hours
Credit Points:	4 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	Physical Education in school
Expected Learning Outcomes:	Know: social functions of physical education; systems of physical education; hygienic bases of health management; prevention of occupational diseases. Be able to: use the means and methods of physical education to maintain a special professional performance, health and prevention of occupational diseases; plan, monitor and manage physical and functional fitness. Possess the skills: show and do exercises, assess the adequacy of the loads to the functional capabilities of the body; management of physical fitness. Demonstrate the ability: to fulfill the Presidential Tests of Physical Fitness; execution of tactics and rules of competition in applied sports.
Intendend use/applicability	Module: Recreation Classes (Intermediate Level)
Content:	<i>Physical Education</i> 1 semester: track and field athletics and basketball (beginner). 2 semester: swimming and volleyball (beginner).
Examination Form, module mark:	<i>Physical Education</i> – graded test. Module mark: the result of the test <i>Physical Education (2 semester)</i>
Technical/Multimedia Facilities:	Gym, swimming pool, sports ground, play court
Study Materials:	1. Track and Field Athletics. Textbook for Physical Education Institutes. Ed. N.G. Azolin, D. P. Markov, 2 nd edition, – M., 2002 2. Basketball. Textbook for Universities. M., 2007. 3. Swimming for Beginners. K. Wilke. M.: Znaniye, 2001 4. Basics of Swimming. Learning and the Way to Perfection. M. Pedroletti. M.: Phoenix, 2006. 5. Volleyball. Textbook. A. V. Belyaev, N. V.Savin. M.: Fizkultura, 2000 6. Physical Education. Textbook for Universities. M. V. Sokolova. Almaty: RIK, 2005.
Date of last amendment	20.01.2023

Module Name:	Module 7: Basics of Electrical Engineering
Code	M7REET(Ba)
Module Elements:	<i>Compulsory Subjects</i> Electric Circuit Theory Basics of Electronic and Measuring Equipment Basics of Radio Engineering and Telecommunications
Semester Number:	3, 4
Person responsible for the module	T.I. Krashevskaya
Lecturer:	Electric Circuit Theory – T.I. Krashevskaya Basics of Electronic and Measuring Equipment – G.V. Savostina Basics of Radio Engineering and Telecommunications – G.V. Savostina
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	3 semester: hours per week – 10 (lectures -1; workshops -1; labs-1; independent work -7); hours per semester – 150. 4 semester: hours per week – 14 (lectures -2; workshops -1; labs-2; independent work -9); hours per semester – 210.
Workload:	Teaching Load: 120 hours Extracurricular Classes: 240 hours Total: 360 hours
Credit Points:	12 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for every subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Physics, Basics of Mathematics
Expected Learning Outcomes:	Know: - mathematical methods of calculation used in radio systems; - theoretical basics of electrical engineering; - basics of metrological support required in the development and adjustment of radio engineering devices; - principles of construction of radio and telecommunication systems; - methods of transmission, reception and processing of signals; Be able to: - make and calculate electrical schematic diagrams; - simulate different processes in radioengineering systems with use of application packages; - use measuring equipment for adjustment and testing of electronic devices; Possess the skills: - determination of the main properties of electrical processes under standard exposures, to produce high-quality physical interpretation of the results; - installation and adjustment of technical means of radio engineering, electronics and telecommunications; Demonstrate the ability: - to analyze and select the required methods for calculation of electrical circuits of direct and alternating current; - to operate systems of radio engineering, electronics and telecommunications, their technical, information and mathematical support and software.
Intendend use/applicability	Modules: Digital Control Systems, Receiving and

	Transmitting Devices, Design of electronics, control and communication systems, Radio Engineering Systems, Modules of modern electronic equipment
Content:	<p><i>Electric Circuit Theory</i> Topology of electrical circuits. Methods of calculation of electrical circuits. Analysis of simple electrical circuits at harmonic actions. The phenomenon of resonance and its importance in radio engineering and telecommunications; serial and parallel oscillatory circuits. Basics of the quadrupole theory.</p> <p><i>Basics of Electronic and Measuring Equipment</i> Basic provisions of metrology and measuring equipment, principles of construction and technical properties of modern measuring equipment. General issues of electrical measurements, measuring transducers, measurement of voltage currents, measurement of parameters of electrical circuits.</p> <p><i>Basics of Radio Engineering and Telecommunications</i> Classification and structure of radio engineering systems. Basics of antenna-feeder devices. Basics of television. Basics of radio and radio transmitting devices. General properties of telecommunication systems.</p>
Examination Form, module mark:	<p>Comprehensive examination including <i>Electric Circuit Theory</i> – written examination <i>Basics of Electronic and Measuring Equipment</i> – computer-based testing <i>Basics of Radio Engineering and Telecommunications</i> – written examination Module mark: the result of the exam <i>Basics of Electronic and Measuring Equipment</i></p>
Technical/Multimedia Facilities:	Multimedia complex. Laboratory of Computer Mathematics and Electronic Simulation. Laboratory of Data Measuring Equipment. Laboratory of Antenna-Feeder and Microwave Devices.
Study Materials:	<ol style="list-style-type: none"> 1. V. P. Popov. Basics of electric circuit theory: Textbook for universities. – Moscow: Vysshaya Shkola, 2000. 2. V. P. Bakalov Basics of electric circuit theory: Textbook for universities. – Moscow: Vysshaya Shkola, 2000. 3. A. B. Novgorodtsev. Theoretical Basics of Electrical Engineering. – St. Petersburg: Piter, 2006. 4. V. V. Frisk Basics of electric circuit theory. - M.: IP RadioSoft, 2002. 5. S. S. Antsyferov, B. I. Golub. General Theory of Measurements. – M.: Goryachaya liniya - Telekom, 2007. 6. V. Y. Shishmarev. Means of Measurement. – SPb.: Akademiya, 2006. 7. V. I. Nefedov. Basics of Radio Electronics: Textbook for universities. - Moscow: Vysshaya Shkola, 2004. 8. G. A. Yerokhin et al. Antenna-Feeder Devices and Radio Wave Propagation. - Moscow: Radio i svyaz, 2006. 9. O. V. Golovin. Radio Receivers: Textbook. - M.: Goryachaya liniya - Telekom, 2002. 10. Radio transmitters / edited by V. V. Shakhgildyan - M.: Svyaz, 2005.
Date of last amendment	20.01.2023

Module Name:	Module 8: Information and Communication Technologies
Code	M8REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Information and Communication Technologies
Semester Number:	3
Person responsible for the module	Y.A. Klishina
Lecturer:	Information and Communication Technologies - Y.A. Klishina
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	3 semester: hours per week – 10 (lectures -1; workshops -1; labs-1; independent work -7); hours per semester – 150.
Workload:	Teaching Load: 45 hours Extracurricular Classes: 105 hours Total: 150 hours
Credit Points:	5 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	This module is based on the knowledge gained by students in the school course of Informatics and University modules of Foreign Language and Basics of Simulation
Expected Learning Outcomes:	Know: basics and prospects of development of new information technologies, local and global networks. Be able to: create information objects of complex structure. Possess the skills: use of modern software, modern computer technology, communication systems and information transfer. Demonstrate the ability to: develop algorithms and flowcharts for solving problems in the subject area.
Intendend use/applicability	Module: Digital Control System
Content:	<i>Information and Communication Technologies</i> An ICT role in key sectors of development of society. Introduction to computer systems. Software. Operating systems. Human-computer interaction. Database systems. Data analysis. Data management. Networks and telecommunications. Cyber safety. Internet technologies. Cloud and mobile technologies. Multimedia technologies. Technology Smart. E-technologies. Electronic business. Information technologies in the professional sphere. Prospects of development of ICT.
Examination Form, module mark:	<i>Information and Communication Technologies</i> - computer-based testing Module mark: the result of the exam <i>Information and Communication Technologies</i>
Technical/Multimedia Facilities:	Multimedia system, IT room with Internet access, educational server of the Department, internal educational network of the University.
Study Materials:	1. Computer Science: Textbook / under the editorship of prof. N.V. Makarova. - M., Finance and Statistics, 2007. 2. Computer Science. Abstract of the Textbook. 2003. 3. Electronic Version. Computer Science: Textbook / under the editorship of prof. N.V. Makarova. - M., Finance and Statistics, 2007. 4. L. S. Voskov. Programming in Visual Basic. 10 printed sheets. Practical Course. 2003. Electronic version. 5. Computer Science. 4 th edition, A. N. Stepanov SPb.- Piter,

	<p>2005.</p> <p>6. Word. Excel. Internet. E-mail: Official Training Course for European Certification. – M.: Triumph, 2008.</p> <p>7. Information Security and Information Protection: a textbook for universities./ V. P. Melnikov, S.A. Kleymenov and A. P. Petrakov; under the editorship of S. A. Kleymenov. – 3rd ed. – Moscow: Akademiya, 2008.</p>
Date of last amendment	20.01.2023

Module Name:	Module 9: Philosophy
Code	M9REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Philosophy
Semester Number:	3
Person responsible for the module	A.V. Nikiforov
Lecturer:	Philosophy - A.V. Nikiforov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	3 semester: hours per week – 10 (lectures -1; workshops -2; independent work -7); hours per semester – 150.
Workload:	Teaching Load: 45 hours Extracurricular Classes: 105 hours Total: 150 hours
Credit Points:	5 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	The study of the subject is based on the knowledge and skills of students obtained in the following school subjects: Man and Society, World history, World Art, Literature, and History, and University modules of Social and Humanitarian Knowledge and History of the State
Expected Learning Outcomes:	Know: forms and methods of scientific knowledge. Be able to: seek and apply new approaches to solving various philosophical problems. Possess the skills: defend personal point of view; analysis and logical thinking. Demonstrate ability to: use scientific views in life and profession.
Intendend use/applicability	Module: Final Academic Assessment
Content:	<i>Philosophy</i> Formation of understanding of a new type of rationality – as a consequence of the development of private and experimental sciences. Philosophical understanding of different forms of scienticism – mechanistic, cybernetic and synergetic. Identification of close interaction of scienticism with philosophical and anthropological problems, as well as elucidation of the true essence of science, religion, philosophy and art.
Examination Form, module mark:	<i>Philosophy</i> - computer-based testing Module mark: the result of the exam <i>Philosophy</i>
Technical/Multimedia Facilities:	PowerPoint presentations, electronic texts, multimedia system
Study Materials:	1. P. V. Alekseev, A.V. Panin. Philosophy: Textbook. M.: Prospect, 2003 2. V. D. Gubin. Philosophy: Textbook. M.: Omega, 2006 3. A. G. Spirkin. Philosophy: Textbook. M.: Gardariki, 2004 4. Philosophy: Textbook/Comp. T. H. Gabitov Almaty, 2003 5. S. F. Denisov. History and Philosophy of Science: Textbook. – Part 2: Science – Religion – Philosophy – Art. – Omsk: Amphora Publishing House, 2010. 6. S. A. Lebedev, V. A. Rubochkin. History of Science. Philosophical and Methodological Analysis. Textbook for Universities. – Moscow: Publishing house: MPSI, 2011
Date of last amendment	20.01.2023

Module Name:	Module 10: Recreation Classes (Intermediate Level)
Code	M10REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Physical Education
Semester Number:	3, 4
Person responsible for the module	A.A. Shitov
Lecturer:	Physical Education - A.A. Shitov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	3 semester: hours per week –4 (workshops -1; independent work -3); hours per semester – 60. 4 semester: hours per week – 4 (workshops -1; independent work -3); hours per semester – 60.
Workload:	Teaching Load: 30 hours Extracurricular Classes: 90 hours Total: 120 hours
Credit Points:	4 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	Module: Physical Education (Beginner Level)
Expected Learning Outcomes:	Know: social functions of physical education; systems of physical education; hygienic bases of health management; prevention of occupational diseases. Be able to: use the means and methods of physical education to maintain a special professional performance, health and prevention of occupational diseases; plan, monitor and manage physical and functional fitness. Possess the skills: show and do exercises, assess the adequacy of the loads to the functional capabilities of the body; management of physical fitness. Demonstrate the ability: to fulfill the Presidential Tests of Physical Fitness; execution of tactics and rules of competition in applied sports.
Intendend use/applicability	-
Content:	<i>Physical Education</i> 3 semester: track and field athletics and basketball (intermediate). 4 semester: swimming and volleyball (intermediate).
Examination Form, module mark:	<i>Physical Education</i> – graded test. Module mark: the result of the test <i>Physical Education (4 semester)</i>
Technical/Multimedia Facilities:	Gym, swimming pool, sports ground, play court
Study Materials:	1. Track and Field Athletics. Textbook for Physical Education Institutes. Ed. N.G. Azolin, D. P. Markov, 2 nd edition, – M., 2002 2. Basketball. Textbook for Universities. M., 2007. 3. Swimming for Beginners. K. Wilke. M.: Znaniye, 2001 4. Basics of Swimming. Learning and the Way to Perfection. M. Pedroletti. M.: Phoenix, 2006. 5. Volleyball. Textbook. A. V. Belyaev, N. V.Savin. M.: Fizkultura, 2000 6. Physical Education. Textbook for Universities. M. V. Sokolova. Almaty: RIK, 2005.
Date of last amendment	20.01.2023

Module Name:	Module 11: Design of Electronic Devices
Code	M11REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Circuitry Engineering of Analog Electronic Devices Work Experience Internship 1
Semester Number:	4
Person responsible for the module	A.A. Savostin
Lecturer:	Circuitry Engineering of Analog Electronic Devices – A.A. Savostin Work Experience Internship 1 – Y.V. Gerasimova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	4 semester: hours per week – 8 (lectures -1; workshops -1; labs-1; independent work -5); Work Experience Internship 1 – 120; hours per semester – 240.
Workload:	Teaching Load: 45 hours Extracurricular Classes: 75 hours Work Experience Internship 1 – 120 hours Total: 240 hours
Credit Points:	8 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Physics, Basics of Mathematics
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - principles of construction and application of analog and digital devices of various functional complexity; - principles of construction and application of radio engineering and telecommunication systems; - mathematical methods of calculation used in the study of radio systems; - rules and methods of installation, processing and adjustment of units of radio engineering devices and systems. <p>Be able to:</p> <ul style="list-style-type: none"> - make and calculate circuit diagrams; - apply mathematical and physical laws in the design of radio systems; - verify, process and adjust the equipment and software used for development, production and adjustment of radio engineering devices and systems. <p>Possess the skills:</p> <ul style="list-style-type: none"> - development of circuit diagrams and printed circuit boards of electronic devices, development of technical documentation; - assemble and install electronic devices; - verify the technical condition of the equipment, organize preventive inspections and maintenance; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - ability to offer optimal circuit solutions for the implementation of various electronic devices - to make and justify specific technical solutions taking into account the requirements of electromagnetic compatibility, ensuring the necessary level of reliability and safety in the development and use of electronic equipment.
Intendend use/applicability	Modules:Receiving and Transmitting Devices, Radio

	Engineering Systems, Modules of modern electronic equipment, Design of electronics, control and communication systems
Content:	<p><i>Circuitry Engineering of Analog Electronic Devices</i> Semiconductor devices; principle of operation of the main circuits. Photoelectric devices; principle of operation of the main circuit inclusion. Amplifying devices; principle of operation of the main circuits.</p> <p><i>Work Experience Internship 1</i> General introduction to the existing technological processes at the enterprise. Detailed study of one of the shops or departments of the plant. Safety and labor protection issues at the enterprise. Performance of one of the types of individual tasks: repair and adjustment of equipment (separate units); independent implementation of some stages of the production process of the shop; or performance of individual experimental work following the instructions of the Department.</p>
Examination Form, module mark:	<p><i>Circuitry Engineering of Analog Electronic Devices</i> - course paper defense <i>Work Experience Internship 1</i> – internship report defense Module mark: the result of the report defense <i>Work Experience Internship 1</i></p>
Technical/Multimedia Facilities:	Multimedia system. Laboratory of Electronics.
Study Materials:	<ol style="list-style-type: none"> 1. V. V. Logvinov <i>Circuitry of Telecommunication Devices, Radio Receivers of Mobile and Fixed Radio Communication Systems, Electrical Circuits Theory</i> / V. V. Logvinov et al. - M.: Solon-press, 2013. - 656 p. 2. S. A. Milenina. <i>Electrical Engineering, Electronics and Circuit Design: Textbook and Practical Course for academic undergraduates</i> / S. A. Milenina, N. K. Milenin. - Lyubertsy: Yurayt, 2016. - 399 p. 3. V. N. Pavlov. <i>Circuitry of Analog Electronic Devices: Textbook</i> / V. N. Pavlov. - M: Akademiya, 2008. - 228 p. 4. M. S. Shumilin. <i>Radio Transmitters</i>. – M: Radio i svyaz, 2010. 5. O. V. Golovin. <i>Radio Receivers</i>. – M: Goryachaya liniya-Telekom, 2004. 6. N. I. Chistyakov. <i>Radio Receivers</i>. – M: Radio i svyaz, 2006. 7. <i>Radio Circuits and Signals: Textbook for higher schools</i>/I. S. Gonorovskiy. - 5th ed., Rev. - M: Drofa, 2006. - 719 p.
Date of last amendment	20.01.2023

Module Name:	Module 12: Digital Control Systems
Code	M12REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Digital Devices Microcontrollers and Microprocessors
Semester Number:	5
Person responsible for the module	S.S. Moldakhmetov
Lecturer:	Digital Devices – S.S. Moldakhmetov Microcontrollers and Microprocessors – P.A. Petrov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	5 semester: hours per week – 20 (lectures -2; workshops -2; labs-2; independent work -14); hours per semester – 300.
Workload:	Teaching Load: 90 hours Extracurricular Classes: 210 hours Total: 300 hours
Credit Points:	10 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Physics, Basics of Mathematics, Basics of Electrical Engineering, Information and Communication Technologies
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - theoretical basics, elements and methods of digital device design; - architecture of microcontrollers and microprocessors of well-known foreign companies; - devices and principles of operation of microprocessors, principles of software and methods of design of hardware and software of microprocessor systems; - theoretical bases and principles of programming in radio electronics; <p>Be able to:</p> <ul style="list-style-type: none"> - calculate the parameters of digital devices and building circuits; - assemble and install electronic devices; - make simple block diagrams of microcontrollers algorithms; - write programs for microcontrollers; - use measuring equipment for adjustment and testing of electronic devices; <p>Possess the skills:</p> <ul style="list-style-type: none"> - design and adjustment of analog, digital and microprocessor devices; <p>Firmware upgrade of microcontrollers using the programmer;</p> <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to apply methods of analysis and synthesis of analog and digital signal processing devices in the field of speech, sound and image processing; - to interpret information on the network statistics - to administer the simplest network equipment.
Intendend use/applicability	Modules: Modern Communication Systems, Radio Engineering Systems
Content:	<i>Digital Devices</i> Concept of digital signal. Digital devices: principles of

	<p>operation, typical circuits. Methods of designing digital devices. Architecture and principles of operation of microprocessors. Principles of software and methods of designing hardware and software microprocessor systems.</p> <p><i>Microcontrollers and Microprocessors</i></p> <p>Microprocessor technology. Bus microprocessor system. The command system of the processor. Families of microcontrollers. Architecture of microcontrollers. Microcontrollers of different families. PIC-microcontrollers. AVR-microcontrollers. ARM-microcontrollers. Programming languages – assembler, C, C++. Debug boards. Arduino Platform. Features of digital devices based on microcontrollers.</p>
Examination Form, module mark:	<p><i>Digital Devices</i> - course paper defense</p> <p><i>Microcontrollers and Microprocessors</i> - course paper defense</p> <p>Module mark: course paper <i>Microcontrollers and Microprocessors</i></p>
Technical/Multimedia Facilities:	<p>Multimedia system. Laboratories of Digital Devices and Microprocessors, Microcontrollers and Special Microprocessors basing on MK AT90S8535.</p>
Study Materials:	<ol style="list-style-type: none"> 1. L. M. Goldenberg Pulse and Digital Devices / L. M. Goldenberg. - Moscow: Ogni, 2009. - 496 p. 2. V. I. Boyko. Microprocessors and Microcontrollers. –SPb.: BHV-Petersburg, 2004. 3. V. V. Solovyev. Logical Design of Digital Systems Based on Programmable Logic Integrated Circuits / Valeriy Vasilyevich Solovyev, Adam Klimovich. - M.: Goryachaya liniya - Telekom, 2014. – 376 p. 4. AVR microcontrollers. Course Book for Beginners : textbook/V. Y. Hartov. – 2nd ed., Updated and revised. – Moscow: MGTU Publishing house, 2012. 280 p. 5. A. K. Naryshkin. Digital Devices and Microprocessors. – M: AKADEMIYA, 2006. 6. Y. V. Novikov. Introduction to Digital Circuit Design. –M.: BINOM. 2007.
Date of last amendment	20.01.2023

Module Name:	Module 13: Receiving and Transmitting Devices
Code	M13REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Signals Generating and Transmitting Devices; Signals Receiving and Processing Devices Theory of Electrical Communication
Semester Number:	5
Person responsible for the module	P.A. Petrov
Lecturer:	Signals Generating and Transmitting Devices – S.S. Moldakhmetov Signals Receiving and Processing Devices – D.V. Ritter Theory of Electrical Communication – P.A. Petrov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	5 semester: hours per week – 28 (lectures -3; workshops -2; labs-4; independent work -19); hours per semester – 420.
Workload:	Teaching Load: 135 hours Extracurricular Classes: 285 hours Total: 420 hours
Credit Points:	14 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Physics, Basics of Mathematics, Basics of Electrical Engineering, Design of Electronic Devices
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - physical and mathematical models of processes and phenomena underlying the principles of radio engineering devices and systems; - modern element base used for the construction of radio transmitters, radio receivers and power supply devices; - general laws of construction of modern electrical communication systems; - main quality indicators of signal transmission through telecommunication channels; <p>Be able to:</p> <ul style="list-style-type: none"> - calculate the parameters of the schemes of radio transmitting and radio receiving devices; - adjust and measure the basic electrical parameters of certain devices for generating, shaping, receiving and processing of radio signals; - apply the basic methods of analysis of information processing radio systems; - apply modern measuring equipment in the experimental study of electrical communication systems; <p>Possess the skills:</p> <ul style="list-style-type: none"> - analysis of the functioning of certain units of modern equipment and devices; - design and calculation main blocks of shaping and transmission of radio signals; - application of a program for calculations of parameters and properties devices for shaping and transmission of radio signals; - application of basic provisions of the theory of noise

	<p>immunity of discrete and analog messages;</p> <ul style="list-style-type: none"> - evaluation of the effectiveness of signal transmission in real electrical communication channels; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to search and analyze scientific and technical information and select the necessary components to create devices for shaping and transmission of radio signals; - to select materials and components for the creation devices for the formation and transmission of radio signals depending on the operating conditions; - to evaluate technical capabilities and develop recommendations for the construction of general and special purpose information transmission systems and networks
Intendend use/applicability	Modules: Modern Communication Systems
Content:	<p><i>Signals Generating and Transmitting Devices</i> General information on radio signal generation devices. Generators with external excitation. Self-oscillators. Frequency synthesizer. Microwave generators.</p> <p><i>Signals Receiving and Processing Devices</i> Noise properties of devices of reception and processing of signals. High-frequency amplifiers of devices of reception and processing of signals. Detectors of radio signals. Interferences on the radio and methods of dealing with them.</p> <p><i>Theory of Electrical Communication</i> General properties of telecommunication systems. Methods of presentation and conversion of messages, signals and noise. Methods of error-correcting coding. Multichannel transmission systems. Communication channels and their models. Digital telecommunication networks.</p>
Examination Form, module mark:	<p>Comprehensive examination including</p> <p><i>Signals Generating and Transmitting Devices</i> – written control examination</p> <p><i>Signals Receiving and Processing Devices</i> – course paper defense</p> <p><i>Theory of Electrical Communication</i> – written control examination</p> <p>Module mark: course paper <i>Signals Receiving and Processing Devices</i></p>
Technical/Multimedia Facilities:	Multimedia system. Laboratories of Radio Receiving and Transmitting Devices, Radio Engineering Telecommunication Systems and Devices, Antenna-Feeder and Microwave Devices.
Study Materials:	<ol style="list-style-type: none"> 1. V. V. Shakhgildyan. Radio Transmitters. – M: Radio i svyaz, 2003. 2. V. I. Kaganov. Radio Transmitters. – M: AKADEMIYA, 2002. 3. V. V. Shakhgildyan. Development of Radio Transmitters. – M: Radio i svyaz, 2001. 4. O. V. Golovin. Radio Receivers. – M: Goryachaya liniya-Telekom, 2004. 5. G. M. Utkin. Devices of Generation and Formation of Radio Signals – M.: Radio i svyaz, 2001. 6. A.V. Veligosha. Devices for Receiving and Processing Radio Signals. – Stavropol: North Caucasus Federal University, 2014. 7. V. A. Romanyuk. Basics of Radio Communication. - Moscow: YURAYT, 2009.

	<p>8. G. B. Mamchev. Basics of Radio and Television Communication. - M.: Goryachaya liniya - Telekom, 2007.</p> <p>9. V. P. Dyakov et al. Electronic Means of Communication. Library of Engineer Series - M.: SOLON-Press, 2005.</p> <p>10. M. V. Garanin, V. I. Zhuravlyev, S. V. Kunegin. Systems and Networks of Information Transmission. – Moscow: Radio i svyaz, 2001.</p> <p>11. M. Moore et al. Telecommunications. Guide for Beginners. – SPb.: BHV-Petersburg, 2003.</p>
Date of last amendment	20.01.2023

Module Name:	Module 14: Radio Engineering Systems
Code	M14REET(Ba)
Module Elements:	<i>Compulsory Subject</i> Multichannel Telecommunication Systems Radio Engineering Systems
Semester Number:	7
Person responsible for the module	Y.V. Gerasimova
Lecturer:	Multichannel Telecommunication Systems – G.V. Savostina Radio Engineering Systems – Y.V. Gerasimova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	7 semester: hours per week – 20 (lectures -2; workshops -1; labs-4; independent work -13); hours per semester – 300.
Workload:	Teaching Load: 105 hours Extracurricular Classes: 195 hours Total: 300 hours
Credit Points:	10 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Basics of Electrical Engineering, Design of Electronic Devices, Digital Control Systems
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - principles of construction of radio engineering and telecommunication systems; - basic telecommunication technologies, types of equipment used in networks, signaling protocols of modern networks, principles of multiservice networks, principles of network management; <p>Be able to:</p> <ul style="list-style-type: none"> - use modern means and methods of collection, processing, storage and output of information in solving various technical problems; - calculate the main properties of radio systems; - use special software for traffic analysis and network monitoring - apply methods of optimal solutions theory in designing radiosystems of information transfer, in radiolocating and radio-navigation systems; <p>Possess the skills:</p> <ul style="list-style-type: none"> - network fault detection and identification; - application of basic statistical methods of analysis and synthesis in radio systems; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to implement the processes of shaping and processing of signals in radio engineering devices and systems; - to apply the methods of the optimal solutions theory in the design of radio systems of measurement, transmission and control.
Intendend use/applicability	Modules: Final Internship, Final Academic Assessment
Content:	<i>Radio Engineering Systems</i> Basics of construction of radio engineering systems. Radio information transmission systems. Theoretical principles of multichannel information transmission systems. Mobile communication systems. Generation of GSM networks.

	<p>Generation of multichannel radio communication. <i>Multichannel Telecommunication Systems</i> General concepts of communication networks and communication systems. The main tasks of multichannel telecommunication systems. The structure of analog transmission systems. Linear and network paths of analog transmission systems. Structure of digital transmission systems. Analog-to-digital and digital-to-analog conversion. Principles of multiplexing. Synchronization. Quality control of transmission channels and paths.</p>
Examination Form, module mark:	<p>Comprehensive examination including <i>Radio Engineering Systems</i> – course paper defense <i>Multichannel Telecommunication Systems</i> - written examination Module mark: course paper <i>Radio Engineering Systems</i></p>
Technical/Multimedia Facilities:	<p>Multimedia system. Laboratories of Radio Engineering Telecommunication Systems and Devices, Digital Communication Systems and Radio Receiving and Transmitting Devices.</p>
Study Materials:	<ol style="list-style-type: none"> 1. V. V. Krukhmalev, V. N. Gordiyenko, A. D. Mochenov. Digital Transmission Systems: Textbook for high schools / Under the editorship of A. D. Mochenov. - M.: Goryachaya liniya - Telekom, 2007. 2. Basics of Telecommunication Systems and Networks: Textbook for universities /V. V. Krukhmalev, V. N. Gordiyenko, A. D. Kochenov et al.; Under editorship of V. N. Gordiyenko and V. V. Krukhmalev. - 2nd ed., Rev. - M: Goryachaya liniya - Telekom, 2008. 3. V. N. Gordienko. Multichannel Telecommunication Systems: Textbook for high schools / V. N. Gordienko, M. S. Tveretskiy. - M.: GLT, 2013. – 396 p. 4. B. I. Kruk Telecommunication Systems and Networks. Textbook in 3 volumes. Volume 1 / B. I. Kruk. - M.: GLT, 2012. - 620 p 5. Y. A. Bogatyrev, Y. A. Grebenko. Circuit Simulation of Electronic Devices. – M.: MEI Publishing house, 2007. 6. A. Vasin. Radio Systems of Information Transmission. – M.: Goryachaya liniya - Telekom , 2005. 7. V. A. Kaplun, Y. A. Brammer, Electronic Devices and Elements of Radio Systems. - M: Vysshaya Shkola, 2002.
Date of last amendment	20.01.2023

Module Name:	Module 15: Profound Language Learning
Code	M15REET(Ba)
Module Elements:	<i>Compulsory subjects</i> Professional Kazakh (Russian) Language Professionally-Oriented Foreign Language
Semester Number:	5
Person responsible for the module	T.K. Sagitdinova
Lecturer:	Professional Kazakh (Russian) Language – D.K. Kuandykova Professionally-Oriented Foreign Language - T.K. Sagitdinova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	5 semester: hours per week – 12 (workshops -4; independent work -8); hours per semester – 180.
Workload:	Teaching Load: 60 hours Extracurricular Classes: 120 hours Total: 180 hours
Credit Points:	6 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	Modules: Foreign Language, National Language
Expected Learning Outcomes:	Know: terminological minimal vocabulary focused on the future profession. Be able to: annotate the scientific text, summarize the content of the text and draw conclusions. Possess the skills: working with special texts, reading and translating with a dictionary. Demonstrate the ability to: discuss professionally-oriented topics in Kazakh (Russian) and the foreign language.
Intendend use/applicability	Module: Final Academic Assessment
Content:	<i>Professional Kazakh (Russian) Language</i> Constitution of Kazakhstan. human rights and freedoms and a man; Labour law. President. Parliament. Law on Languages. Entrepreneurship in Kazakhstan. Public and private entrepreneurship. Employment. On education. Economic opportunities of Kazakhstan. Kazakhstan and international organizations. Record keeping. <i>Professionally-Oriented Foreign Language</i> Improving students' English language skills: improving the skills of speaking, writing, understanding of oral and written speech; the study of the rules of construction of scientific and professional speech, the features of the language of reports and presentations; the study of the basic scientific terms, the consolidation of all major grammatical structures and phenomena.
Examination Form, module mark:	Comprehensive examination including: <i>Professional Kazakh (Russian) Language - computer-based testing.</i> <i>Professionally-Oriented Foreign Language - computer-based testing.</i> Module mark: the result of the exam <i>Professionally-Oriented Foreign Language</i>
Technical/Multimedia Facilities:	Language laboratory, interactive whiteboard, AUDIO and video equipment, Internet

Study Materials:	<ol style="list-style-type: none"> 1. D.E. Zemach, L.A.Rumisek. Academic Writing. MacMillan Press, 2006. 2. Key Concepts in Information and Communication Technology (Palgrave) by Roger I. Cartwright. 3. Hawley Roddick, Business Writing Makeovers, AST, Astrel, 2004. 4. A. M. Aldanova, D. K. Akanova. Social and Business Kazakh Language. Almaty, 2002 5. K. Atygayeva, T. Akhmetova. Business Kazakh Language. Petropavlovsk, NKSU. 2010. 6. A. O. Musa, I.M. Tolegenov. Kazakh Language. Almaty, 2003 7. T.A. Sauytova, R.N. Zholdybayeva. Kazakh Language, 2006.
Date of last amendment	20.01.2023

Module Name:	Module 16: Social and Humanitarian Knowledge
Code	M16REET(Ba)
Module Elements:	<i>Compulsory Subjects</i> Manashtanu Political and Social Studies Cultural Studies and Psychology
Semester Number:	1, 2
Person responsible for the module	A.V. Nikiforov
Lecturer:	Manashtanu – N.A. Abuov Political and Social Studies – A.V. Chukhno Cultural Studies and Psychology - A.V. Nikiforov
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 10 (lectures -4; independent work -6); hours per semester – 150. 2 semester: hours per week – 6 (lectures -2; independent work -4); hours per semester – 90.
Workload:	Teaching Load: 90 hours Extracurricular Classes: 150 hours Total: 240 hours
Credit Points:	8 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	The study of the discipline is based on the knowledge and skills of students obtained in the following subjects of school: Man and Society, World History, World Art, Literature, History.
Expected Learning Outcomes:	Know: history of the University, historical milestones in the life and work of academician M. Kozybayev; theoretical and practical problems of modern business communication; the essence of socio-political processes and the role of political parties and social movements; cultural heritage of different religions. Be able to: apply the principles and methods of historical knowledge; apply the methods of collecting sociological information; freely navigate in issues of world religions. Possess the skills: work with historical sources of information; analyze the situation of conflict of interest and moral choice; ethics and psychology of business conversation. Demonstrate the ability to: professionally understand the social, cultural and political conditions of the modern world.
Intendend use/applicability	Module: Philosophy
Content:	<i>Manashtanu</i> The history of the University, the prospects for the development of the University in the future, historical milestones in the life and work of academician M. Kozybayev in different periods of his life, a scientific problem, which developed M. Kozybayev in the course of his life. <i>Political and Social Studies</i> Society as a socio-cultural and socio-dynamic system; system and structural-functional approaches to the analysis of society; the basic laws and patterns of development of society. Personality and society, factors of personality formation. Social institutions and processes. Methods and techniques of

	<p>sociological research. Analysis of the collected information. Report and recommendations on the results of sociological research. Object, subject and method of political science; functions of political science; political life and power relations; role and place of politics in the life of modern societies; civil society, its origin and features; institutional aspects of politics; political system; political parties, political conflicts and ways of their resolution; political elites; foreign policy of the Republic of Kazakhstan.</p> <p><i>Cultural Studies and Psychology</i> The concept and essence of culture. Typology of culture. Culture and people. The genesis of the culture. Values of ancient cultures. Values of national Kazakh culture. Methods and branches of psychology. The problem of personality in psychology. Psychology of groups and communities.</p>
Examination Form, module mark:	<p>Comprehensive examination including <i>Manashtanu</i> – reference paper <i>Political and Social Studies</i> - computer-based testing <i>Cultural Studies and Psychology</i> computer-based testing Module mark: the result of the exam <i>Cultural Studies and Psychology</i></p>
Technical/Multimedia Facilities:	<p>PowerPoint presentations, electronic texts and maps, multimedia system</p>
Study Materials:	<ol style="list-style-type: none"> 1. M. K. Gorshkov. Applied sociology: methodology and methods: Textbook /M. K. Gorshkov, F. E. Sheregi. – M.: Alha_M:INFRA-M, 2009. 2. S. A. Kravchenko. Sociology: Paradigms from the Perspective of Sociological Imagination: Textbook for universities /S. A. Kravchenko. – 2nd ed. updated and revised.– M.: Egzamen Publishing House, 2004. 3. K. S.Gadzhiyev. Political Science: Basic Course: Textbook./ K. S. Gadzhiyev. - 2nd ed., updated and revised. – M.: YURAIT, 2012. 4. Political Science: Textbook for Bachelors / under the editorship of V. A. Achkasov, V. A. Gutorov. - 2nd ed., updated and revised. – M.: YURAIT, 2012. 5. V. N. Lavrinenko. Political Science. -3rd ed., updated and revised - M.: UNITY, 2010. 6. S. K. Zhantikeyev. Psychology, Yelorda, Astana, 2011. 7. R. S. Nemov. Psychology. Vol. 1,2, M., Vldos.2012. 8. Cultural Studies. / Textbook under the editorship of M. G. Bagdasaryan, 5th ed. M.: Vysshaya shkola, 2006. 9. V. G. Torosyan. Cultural Studies. History of World and National Culture. M., 2005. 10. Y. A. Malyuga, Cultural Studies. M., 2005
Date of last amendment	<p>20.01.2023</p>

Module Name:	Module 17: Final Internship
Code	M17REET(Ba)
Module Elements:	<i>Compulsory subjects</i> Work Experience Internship 3 Pre-Graduation Internship
Semester Number:	8
Person responsible for the module	D.V. Ritter
Lecturer:	Work Experience Internship – D.V. Ritter Pre-Graduation Internship – Y.V. Gerasimova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	8 semester: Work Experience Internship 3 – 300 hours. Pre-Graduation Internship – 150 hours.
Workload:	Extracurricular Classes: 450 hours Total: 450 hours
Credit Points:	15 ECTS
Conditions for Examinations:	For admission to the final control, the student must complete the internship program in full
Recommended Conditions:	Completion of theoretical training on the degree programme
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - basic principles, methods, software engineering and industrial processing means in professional activity; - stages of electronic devices design; - basics of metrological support required for development and adjustment of radio engineering devices; <p>Be able to:</p> <ul style="list-style-type: none"> - use modern means and methods of collection, processing, storage and output of information in solving various technical problems; - make and calculate circuit diagrams; - assemble and install electronic devices; - use measuring equipment for adjustment and testing of electronic devices; - check the functioning, adjustment and control of the main parameters of radio-television equipment; - configure and install antennas and microwave devices; - provide safe working conditions in professional activity; - use economic theory to analyze main economic processes in the professional sphere; - organize work in accordance with current legislation, apply regulatory documentation in the design and operation of radio equipment; <p>Possess the skills:</p> <ul style="list-style-type: none"> - work with normative documentation; - development of circuit diagrams and printed circuit boards, development of technical documentation; - simulation of objects and processes in order to analyze and optimize their parameters using available research tools; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to independently carry out the formulation of the research problem, the formation of a plan for its implementation, and the selection of research methods and processing of results; - to offer optimal circuit solutions for the implementation of various electronic devices;

	<p>- operate and maintain modern antenna-feeder devices;</p> <p>- to make and justify specific technical solutions taking into account the requirements of electromagnetic compatibility, ensuring the required level of reliability and safety in the development and operation of electronic equipment</p>
Intendend use/applicability	Module: Final Academic Assessment
Content:	<p><i>Work Experience Internship 3</i> Introduction of the existing production and practice bases. Implementation of individual tasks: study and participation in the design stages of radio engineering devices and systems; participation in the testing works; preparation of supporting documentation.</p> <p><i>Pre-Graduation Internship</i> Literary and patent search on the topic of the thesis. Development of the block diagram of the designed device. Development and calculation of individual units of the electrical schematic diagram of the designed device.</p>
Examination Form, module mark:	<p><i>Work Experience Internship 3</i> – report defense</p> <p><i>Pre-Graduation Internship</i> - report defense.</p>
Technical/Multimedia Facilities:	Technical equipment, radio and telecommunication systems, complexes and devices of the practice base. Multimedia system (when defending the report).
Study Materials:	<ol style="list-style-type: none"> 1. S. I. Alyabyev, A. V. Vykhodets. Broadcasting and Electroacoustics: Textbook for higher schools / Under the editorship of Y. A. Kovalgin. – M: Audio i svyaz, 2005. 2. S. Richter. Digital Broadcasting. – M.: Goryachaya liniya – Telekom, 2012. 3. Metrology, Standardization and Certification: Textbook for university students. – M: Yurayt Publishing House, 2011. 4. Labor Protection and Radio-Electronic Industry. Ed. S. P. Pavlov – M.: Radio i svyaz, 2001. 5. Development and Execution of Design Documentation for Electronic Equipment: Reference Book / Ed. E. T. Romanycheva. – M: Radio i svyaz, 2003. 6. Y. Kolosovskiy. Signal Receiving and Processing Devices. – M.: Goryachaya liniya – Telekom, 2012. 7. G. V. Savostina Guidelines for Professional Practices. – Petropavlovsk: NKSU named after M. Kozybayev, 2014.
Date of last amendment	20.01.2023

Module Name:	Module 18: Final Academic Assessment
Code	M18REET(Ba)
Module Elements:	<i>Compulsory subjects</i> State examination in the specialty Developing and defending a thesis
Semester Number:	8
Person responsible for the module	Y.V. Gerasimova
Lecturer:	State examination in the specialty –Y.V. Gerasimova Developing and defending a thesis –Y.V. Gerasimova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	8 semester: hours hours per semester – 450.
Workload:	Extracurricular Classes: 450 hours Total: 450 hours
Credit Points:	15 ECTS
Conditions for Examinations:	Completion of the Degree Programme and writing a bachelor's thesis
Recommended Conditions:	Completion of the full course of study on the Degree Programme
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - mathematical methods of calculation used in the analysis of radio systems; - stages of electronic devices design; - graphic editors for drawing schematic diagrams of electronic devices; <p>Be able to:</p> <ul style="list-style-type: none"> - define goals, set research and design tasks in radio engineering; - apply mathematical and physical laws in the design of radio systems; - use modern means and methods of collection, processing, storage and output of information in solving various technical problems; - make and calculate the circuit diagrams; - assemble and install electronic devices; - use measuring equipment for adjustment and testing of electronic devices; - use the economic theory to analyze main economic processes in the professional sphere; - make mathematical models of automatic control systems; - study dynamic and static processes of automatic control systems; <p>Possess the skills:</p> <ul style="list-style-type: none"> - application of various methods of research of automatic control systems; - construction of measuring systems based on personal computers; - development of circuit diagrams and printed circuit boards, development of technical documentation; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to independently carry out the formulation of the research problem, the formation of a plan for its implementation, and the selection of research methods and processing of results;

	- to offer optimal circuit solutions for the implementation of various electronic devices
Intendend use/applicability	Professional activity
Content:	<p><i>State examination in the specialty</i> To demonstrate knowledge and skills gained in the course of the following subjects: Basics of Radio Engineering and Telecommunications, Circuit Design of Analog Electronic Devices/Circuit and System Engineering of Electronic Means, Digital Devices and Microprocessors/Integrated and Microprocessor Technology, Antenna-Feeder Devices/Microwave Devices</p> <p><i>Developing and defending a thesis</i> Literary and patent search on the topic under study. Selection and analysis of theoretical material on the topic. Development of the block diagram of the designed device. Development and calculation of the schematic diagram of the electrical device. Development of the printed circuit board device. Analysis of the reliability of the device, as well as calculation of economic indicators and issues of labor protection and industrial ecology in the design and implementation of the test device or system. Execution of the thesis. Passing the licensing procedure. Passing the examination for plagiarism. Preparation for the defense of the thesis.</p>
Examination Form, module mark:	Comprehensive module examination including <i>State examination in the specialty</i> – written examination <i>Developing and defending a thesis</i> – defending a bachelor’s thesis
Technical/Multimedia Facilities:	Laboratories of Computer Mathematics and Electronic Simulation; Antenna-Feeder and Microwave Devices; Radio Receiving and Transmitting Devices; research laboratory of Mathematical Simulation and Design of Robotic Systems, laboratories of Data Measuring Equipment and Electronics. Precision manufacturing complex for printed circuit boards ProtoMat S42.
Study Materials:	<ol style="list-style-type: none"> 1. A. M. Sazhnev, L. G. Rogulina. Electrical Converting Devices of Radio-Electronic Systems. – Novosibirsk: Publishing house of NSTU, 2012. 2. V. Y. Shishmarev. Components and Elements of Automatic Control Systems. - M: Akademiya, 2005. 3. V. A. Rogov, G. G. Pozdnyak. Methods and Practice of Technical Experiments. – M: Akademiya Publishing center, 2005. 4. V. B. Brodin, A.V. Kalinin Systems with Microcontrollers. – M: ECOM, 2002. 5. Y. P. Ugryumov. Digital Circuitry. – SPb.: BHV – St. Petersburg, 2000. 6. V. B. Steshenko. Computer-Aided Design of Electronic Devices. – Moscow: Nolidzh, 2002. 7. V. N. Pavlov, V. N. Nogin. Circuitry of Analog Electronic Devices. – M.: Gotyachaya liniya-Telekom. 2005.
Date of last amendment	20.01.2023

Module Name:	Module 19: Basics of the Profession
Code	M19REET(Ba)
Module Elements:	<i>Elective Subjects</i> Introduction to the Profession Introduction to the Specialty Materials Science in Radio Engineering Basics of Materials Science Computer Graphics; Computer Simulation; Programming Technics; Software Programming Languages; Practical Training
Semester Number:	1, 2
Person responsible for the module	T.I. Krashevskaya
Lecturer:	Introduction to the Profession – T.I. Krashevskaya Introduction to the Specialty – B.M. Abilmazhinov Materials Science in Radio Engineering – T.I. Krashevskaya Basics of Materials Science – S.I. Latypov Computer Graphics –S.I. Latypov Computer Simulation –S.I. Latypov Programming Technics – L.V. Dolmatova Software Programming Languages – N.V. Astapenko Practical Training – T.I. Krashevskaya
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	1 semester: hours per week – 8 (lectures -1; workshops -1; labs-1; independent work -5); hours per semester – 120. 2 semester: hours per week – 16 (lectures -3; workshops -1; labs-1; independent work -11); hours per semester – 240. Practical Training: 30 hours.
Workload:	Teaching Load: 120 hours. Extracurricular Classes: 240 hours. Practical Training: 30 hours. Total: 390 hours
Credit Points:	13 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	-
Expected Learning Outcomes:	Know: - main goals and objectives of the study; - main directions of modern development of science and technology in the field of radio engineering, telecommunications, computer technology and electronics; - trends in technical development of modern society and prospects for the employment; - structure and properties of radio materials, their practical application and prospects of development of materials used in radio electronics; - principles of construction and application of analog and digital devices of various functional complexity; - the basic applications for working with design documentation, calculations and models in the designing; Be able to: - independently work with primary sources of technical

	<p>information;</p> <ul style="list-style-type: none"> - state the main problems and tasks of the current period of study in a technically competent manner; - classify general processes and phenomena of the technical progress in the field of radio engineering following the most characteristic distinctive signs; - make and calculate circuit diagrams; - use various options of the applications studied to obtain during in the designing; <p>Possess the skills:</p> <ul style="list-style-type: none"> - use the advantages provided by computer technology in the educational process; - use the knowledge gained on the properties of radio materials in practice; - to develop drawings of finished products, as well as mathematical processing of project data using a personal computer; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - evaluate technical capabilities and develop recommendations for the construction of general and special purpose information transmission systems and networks; - be able to competently solve problems related to the properties and production of radio materials and further improvement of technological processes; - assemble and install electronic devices; - to use computer graphics and data acquisition software in the designing of process and design documentation; - use measuring equipment for adjustment and testing of electronic devices.
Intendend use/applicability	Modules: Analysis and synthesis of electrical circuits.
Content:	<p><i>Introduction to the Specialty</i> Radio engineering as a branch of science and technology. Basic concepts of radio electronics and telecommunications. Basic principles of transmission and reception of information. Analog and discrete data transmission systems.</p> <p><i>Introduction to the Profession</i> Qualification characteristics of a specialist in radio engineering, electronics and telecommunications. Radio electronics and communication, their role in modern scientific and technical progress. Engineering tasks in the field of energy, instrumentation and radio engineering.</p> <p><i>Materials Science in Radio Engineering</i> Structure and properties of radio materials, their practical application and prospects of development of materials. Production of semiconductors, devices and piezoelectric crystals. Structures and technology of integrated circuits.</p> <p><i>Basics of Materials Science</i> Physical and chemical regularities of the materials structure formation. Different types and properties of materials: those of conductors, semiconductors, electromagnetic and dielectric. Passive components of electronic equipment.</p> <p><i>Computer Graphics</i> Hardware and functional capabilities of a modern personal computer. Pictorial symbols of elements in the drawing. Drawing up design documentation. Use of Splan application for preparation of drawings. Use of AutoCAD to create drawings.</p>

	<p><i>Computer Simulation</i> Hardware and functional capabilities of a modern personal computer. MATLAB application for mathematical simulation of electrical processes. Electronics Workbench application for simulation of electrical processes. Microsoft Office Excel to solve common tasks. Microsoft Office Word for design documentation. AutoCAD to create drawings.</p> <p><i>Programming Technics</i> Basics of algorithmization, methods of recording algorithms, basics of programming technology, programming style, structure of programs, methods of debugging and testing programs, data types, general information on object-oriented programming.</p> <p><i>Software Programming Languages</i> Learning of the classification of programming languages, data types, operations, operators of C++ programming language, program development using subroutines, standard modules, programming style, programming quality indicators, methods of debugging and testing programs, basics of object-oriented programming, memory and addressing, program development using pointers, programming features in C++.</p> <p><i>Practical Training</i> Introduction to the hardware and software of physical experiment. Classification, physical properties and area of application of the main radioactive elements used in electronics. Assembly and configuration of electronic devices built on a modern element base.</p>
Examination Form, module mark:	<p><i>Introduction to the Profession</i> – reference paper <i>Introduction to the Specialty</i> – reference paper <i>Materials Science in Radio Engineering</i> – computer-based testing <i>Basics of Materials Science</i> – computer-based testing <i>Computer Graphics</i> - free-form examination <i>Computer Simulation</i> - free-form examination <i>Programming Technics</i> - free-form examination <i>Software Programming Languages</i> - free-form examination <i>Practical Training</i> – training report defense Module mark: the result of the report defense <i>Practical Training</i></p>
Technical/Multimedia Facilities:	Multimedia system. IT room. Laboratories of Radio Engineering Telecommunication Systems and Devices, and Electrical Engineering and Materials Science.
Study Materials:	<ol style="list-style-type: none"> 1. V. A. Romanyuk. Basics of Radio Communication. - M: YURAYT, 2009. 2. I. S. Gonorovsky. Basics of Radio Engineering / I. S. Gonorovsky. - M: State Publishing House of Literature on Communication and Radio, 2017. - 726 p. 3. N. M. Izyumov. Basics of Radio Engineering / N. M. Izyumov, D.P. Linde. - M: Gosenergoizdat, 2013. - 512 p. 4. N. B. Dogadin. Basics of Radio Engineering: Textbook. - SPb.: Lan, 2007. 5. M. Moore et al. Telecommunications. Guide for Beginners. – SPb.: BHV-Petersburg, 2003. 6. I. Chernukh. Simulation of Electrical Devices in MATLAB, SimPowerSystems and Simulink. – M: Piter Publishing House, 2007. 7. I. I. Aliyev. Virtual Electrical Engineering. Computer

	<p>Technologies in Electrical Engineering and Electronics. – Kyiv: RadioSoft, 2003.</p> <p>8. I. Chernukh. Simulation of Electrical Devices in MATLAB, SimPowerSystems and Simulink. – M: Piter PH, 2007.</p> <p>9. A. S. Zhuravlev. AutoCAD for Designers. Standards of the Unified System for Design Documentation in AutoCAD 2009/2010/2011. Practical Tips from a Designer. – M: Nauka I tekhnika, 2010.</p> <p>10. V. Dyakonov. VisSim+Mathcad+MATLAB. Visual Mathematical Simulation. M: SOLON-Press, 2004.</p> <p>11. I. I. Aliyev. Virtual Electrical Engineering. Computer Technologies in Electrical Engineering and Electronics. – Kyiv: RadioSoft, 2003.</p> <p>12. N.A. Litvinenko. C++Programming Technology. Beginners //St. Petersburg 2009, BHV</p> <p>13. M.V. Kuznetsov. C++ Master Class in Problems and Examples //St. Petersburg 2010, BHV</p>
Date of last amendment	20.01.2023

Module Name:	Module 20: Analysis and synthesis of electrical circuits
Code	M20REET(Ba)
Module Elements:	<i>Elective Subjects</i> Electric Circuit Theory 2 Basics of Electric Circuit Theory Metrology and Radio Measurements Engineering Measurements Data Measuring Equipment Radio Circuits and Signals Analysis and Synthesis of Radio Signals Circuitry and System Engineering of Electronic Devices Industrial Electronics Basics of Automation Automatic Control CAD Systems Basics of Computer-Aided Design Radioautomatics; Computer Networks; WEB-Programming
Semester Number:	3, 4
Person responsible for the module	Y.V. Gerasimova
Lecturer:	Metrology and Radio Measurements – Y.V. Gerasimova Engineering Measurements – T.I. Krashevskaya Data Measuring Equipment– Y.M. Dariy Electric Circuit Theory 2 – T.I. Krashevskaya Basics of Electric Circuit Theory – V.P. Ivel Radio Circuits and Signals – A.A. Savostin Analysis and Synthesis of Radio Signals – A.A. Savostin Circuitry and System Engineering of Electronic Devices – Y.V. Gerasimova Basics of Automation - N.V. Zykova Automatic Control – Y.V. Gerasimova CAD Systems – D.V. Ritter Basics of Computer-Aided Design – P.A. Petrov Industrial Electronics - A.A. Savostin Computer Networks – I.R. Kasimov WEB-Programming – N.V. Astapenko Radioautomatics – Y.V. Gerasimova
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	3 semester: hours per week – 26 (lectures -4; workshops -2; labs-4; independent work -16); hours per semester – 390. 4 semester: hours per week – 20 (lectures -2; workshops -2; labs-4; independent work -12); hours per semester – 300.
Workload:	Teaching Load: 270 hours Extracurricular Classes: 420 hours Total: 690 hours
Credit Points:	23 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Physics, Basics of Mathematics, Basics of the

	Profession
Expected Learning Outcomes:	<p>Know:</p> <ul style="list-style-type: none"> - basics of metrological support required for development and adjustment of radio engineering devices; - theoretical bases of electrical engineering; - principles of construction and application of analog and digital devices of various functional complexity; - principles of construction and application of radio engineering and telecommunication systems; - mathematical methods of calculation used in the study of radio systems; - physical and mathematical models of processes and phenomena underlying the principles of radio engineering devices and systems; - parameters, properties and area of use of radio signals; - methods of transmission, reception and processing of signals; - main widely used approaches and methods of statistical radio engineering; - rules and methods of installation, processing and adjustment of units of radio engineering devices and systems; - the basic concepts of automation, the basic principles of regulation and control, and the basic elements of automatic systems; - principles of organization of computer-aided design (CAD) systems; - CAD software and hardware; - methods of network configuration and testing. <p>Be able:</p> <ul style="list-style-type: none"> - process measurement results, evaluate measurement errors; - make and calculate circuit diagrams; - apply mathematical and physical laws in the design of radio systems; - calculate the parameters of the signals when they pass through the radio circuit; - use the basic statistical methods of analysis and synthesis in radio systems; - verify, process and adjust the equipment and software used for development, production and adjustment of radio engineering devices and systems; - make functional schemes, to calculate indicators of management quality; - use software application packages for calculations, simulation and automation of design of radio electronic devices and systems; - configure network equipment settings. <p>Possess the skills:</p> <ul style="list-style-type: none"> - construction of measuring systems based on personal computers; - work with regulatory documentation; - development and implementation of measures to protect people and the environment from negative impacts; - verify the technical condition of the equipment, organize preventive inspections and maintenance; - development of circuit diagrams and printed circuit boards of electronic devices, development of technical documentation; - assemble and install electronic devices; - design of radio receiving and radio transmitting systems; - selection of different statistical methods of analysis of radio systems; - to solve problems on the basis of modern software packages; - work with programs and packages of Electronics Workbench, PSpice, MicroCAP V, OrCAD, P CAD; - use the skills to organize local networks of different topologies. <p>Demonstrate the ability:</p>

	<ul style="list-style-type: none"> - ability to offer optimal circuit solutions for the implementation of various electronic devices - choose a technical solution for the creation of electrical signals used in the transmission of information with the desired properties - apply methods of analysis and synthesis of analog and digital signal processing devices in the field of speech, sound and image processing. - to make and justify specific technical solutions taking into account the requirements of electromagnetic compatibility, ensuring the necessary level of reliability and safety in the development and use of electronic equipment. - to independently design and conduct research on automatic control systems. - to use applications in various aspects of electronic design; - manipulating the parameters of program access to the network.
Intendend use/applicability	Modules: Modules of modern electronic equipment, Design of electronics, control and communication systems
Content:	<p><i>Metrology and Radio Measurements</i> Measurement errors. Preparation, conduct and processing of the results of the experiment. Methods and means of measurement. Methods of measurement of time parameters of signals, frequency and phase shift. Methods of measurement of voltage and energy parameters of signals. Study of signals in the time and frequency domains.</p> <p><i>Engineering Measurements</i> Classification of technical measuring instruments. Methods of measurement and control of parameters and properties of circuits. Processing of measurement results. Basics of standardization. Basics of certification. Methods of construction of measuring circuits.</p> <p><i>Data Measuring Equipment</i> Development of materials relating to the measurement and evaluation, processing of measuring signals, study of modern principles of construction of power measuring equipment, measuring information systems and complexes, use of methods and measuring instruments in various practical areas.</p> <p><i>Electric Circuit Theory 2</i> Transients in electrical circuits. Electrical circuits with distributed parameters. Electrical circuits with feedback. Nonlinear electrical circuits and methods of their calculation. Electrical filters. Corrective electrical circuits. Discrete electrical circuits. Digital filters.</p> <p><i>Basics of Electric Circuit Theory</i> Basic concepts of the circuit theory. Basic methods of analysis of linear electrical circuits. Linear circuits under harmonic influence. Frequency response and resonance phenomena. Basics of quadrupole theory. Methods of transient analysis in linear circuits. Electrical filters. Circuits with distributed parameters. Bases of synthesis of electric circuits.</p> <p><i>Radio Circuits and Signals</i> Radio signals with amplitude and angular modulation. Spectral analysis of signals. Principles of generating harmonic oscillations. Correlation analysis of signals. Analysis of signals passing through narrow-band circuits. Filter synthesis. Random signal. Numerical methods for calculating linear circuits.</p> <p><i>Analysis and Synthesis of Radio Signals</i> Methods of analysis and synthesis of signals in radio engineering devices and systems. Analysis of properties and parameters of formation and processing of signals in radio engineering devices and systems. Synthesis of optimal and quasi-optimal basic procedures of signal generation and processing in radio engineering devices and</p>

	<p>systems. Analysis of qualitative characteristics and performance indicators.</p> <p><i>Circuitry and System Engineering of Electronic Devices</i> Basics of construction and principles of electronic circuits. Amplifying devices. Basic parameters of operational amplifiers. Stages of electronic devices design. Generation of oscillations. Radio engineering systems of data transmission. Secondary power sources of radio electronic means. Elements of digital circuitry. Electronic systems. Implementation of radio communication systems.</p> <p><i>Industrial Electronics</i> Semiconductor diodes. Bipolar transistor. Field-effect transistors. Transistors connection diagram and operation modes of the transistors in the amplification stages. Thyristors. Power amplifier. Integral operating amplifiers and circuits with them. Feedback Theory. Optoelectronic devices. Power supply. Rectifier circuits (including 3-phase). Frequency converter. Digital devices. Logic elements and synthesis of combinational logic circuits. Microcontrollers. Microprocessors.</p> <p><i>Basics of Automation</i> General information on automation systems and their constituent elements. Sensors and transducers. Relay. Amplifiers. Non-contact magnetic relay and stabilizers. Execution units. Automatic control system. Automatic measuring systems.</p> <p><i>Automatic Control</i> Classification of automated control systems (ACS). Description of ACS in the frequency domain. ACS Stability. Assessment of ACS quality and accuracy. Synthesis of ACS</p> <p><i>CAD Systems</i> Notion and stages of design of electronic systems. Main structure of technical and linguistic support of CAD. PCAD as an interactive design package. Design of circuits and printed circuit boards.</p> <p><i>Basics of Computer-Aided Design</i> Theoretical basics of computer-aided design. Software for automation of production of design, technological and normative-technical documentation. Main properties of modern software packages. Mathematical models of radio-electronic design objects.</p> <p><i>Computer Networks</i> Mastering the principles of organization and functioning of computer networks, features of the personal computer in networks.</p> <p><i>WEB-Programming</i> Web-Programming is designed to promote students' familiarity with computer telecommunications and possible approaches to the development of hypertext documents intended for publication in the global computer network of Internet. Training in the development of Web-pages on the basis of an integrated approach; training in Internet programming on the client and server side; training in the use of databases in the development of Web-projects; training in methods of marketing on the Internet, advertising and promotion of developed Internet-resources.</p> <p><i>Radioautomatics</i> Principles of construction of radioautomatic systems. Classification. The main elements of radioautomatic systems. Study of transient processes. Frequency characteristics of radio automatic systems. Analysis of linear systems of radio automatics. Analysis of nonlinear systems. Synthesis of linear filters. Discrete systems.</p>
Examination Form, module mark:	<p><i>Metrology and Radio Measurements</i> – written examination</p> <p><i>Engineering Measurements</i> – written examination</p>

	<p><i>Electric Circuit Theory</i> - free-form examination <i>Basics of Electric Circuit Theory</i> - written examination <i>Radio Circuits and Signals</i> - written examination <i>Analysis and Synthesis of Radio Signals</i> - written examination <i>Circuitry and System Engineering of Electronic Devices</i> - free-form examination <i>Basics of Automation</i> - reference paper <i>Automatic Control</i> - reference paper <i>CAD Systems</i> – free-form examination <i>Basics of Computer-Aided Design</i> – written examination <i>Computer Networks</i> – reference paper <i>WEB-Programming</i> – computer-based testing <i>Data Measuring Equipment</i> - written control examination <i>Industrial Electronics</i> - computer-based testing <i>Radioautomatics</i> - reference paper Module mark: free-form examination <i>Elective Subject</i></p>
Technical/Multimedia Facilities:	<p>Multimedia system. IT room. Laboratories of Computer Mathematics and Electronic Simulation, Electronics, Data Measuring Equipment. Radio Engineering Telecommunication Systems and Devices, Electronics and Radio Receiving and Transmitting Devices. Research laboratory of Robotics, Microelectronics and Energy Ecology.</p>
Study Materials:	<ol style="list-style-type: none"> 1. A. F. Beletskiy. Theory of Linear Electrical Circuits: Textbook. 2nd ed.. – SPb.: Lan Publishing House, 2009. – 544 p. 2. V. P. Bakalov, V. F. Dmitrikov, B. I. Kruk. Basics of Circuit Theory: Textbook for universities; Edited by V. P. Bakalov. 3rd ed. – M.: Goryachaya liniya – Telekom, 2009. – 596 p. 3. A. B. Novgorodtsev. Theoretical Basics of Electrical Engineering. 30 lectures on the Electrical Circuits Theory. –SPb.: Piter, 2006. 4. D. I. Panfilov, I. N. Chepurin, V. N. Mironov. Electrical Engineering and Electronics in Exercises. – M.: DODEKA, 2000. 5. D. F. Tartakovskiy, A. S. Yastrebov. Metrology, Standardization and Technical Measuring Instruments. – M: Vysshaya Shkola, 2006. 6. V. Nefedov, A. Sigov, V. Bitjukov. Electroradio Measurements. – M: Forum, 2005. 7. V. I. Nefedov. Metrology and Electroradio Measurements in Telecommunication Systems. – M: Vysshaya Shkola, 2005. 8. G. V. Savostina. Guidelines for Professional Practices. – Petropavlovsk: NKSU named after M. Kozybayev, 2014. 9. V. V. Logvinov Circuitry of Telecommunication Devices, Radio Receivers of Mobile and Fixed Radio Communication Systems, Electrical Circuits Theory / V. V. Logvinov et al. - M.: Solon-press, 2013. - 656 p. 10. S. A. Milenina. Electrical Engineering, Electronics and Circuit Design: Textbook and Practical Course for academic undergraduates / S. A. Milenina, N. K. Milenin. - Lyubertsy: Yurayt, 2016. - 399 p. 11. V. N. Pavlov. Circuitry of Analog Electronic Devices: Textbook / V. N. Pavlov. - M: Akademiya, 2008. - 228 p. 12. M. S. Shumilin. Radio Transmitters. – M: Radio i svyaz, 2010. 13. O. V. Golovin. Radio Receivers. – M: Goryachaya liniya-Telekom, 2004. 14. N. I. Chistyakov. Radio Receivers. – M: Radio i svyaz, 2006. 15. Radio Circuits and Signals: Textbook for higher schools/I. S. Gonorovskiy. - 5th ed., Rev. - M: Drofa, 2006. - 719 p. 16. V. Y. Shishmarev. Automation. – M: Akademiya, 2013 17. Y. Lazareva, Y. F. Martemyanov. Linear Automatic Control Systems. Tver State Technical University. Textbook. Tver, 2010

	<p>18. A. S. Vostrikova, G. A. Frantsuzova. Theory of Automatic Control – Novosibirsk: NSTU, 2012</p> <p>19. V. Y. Shishmarev. Parts and Elements of Automatic Control Systems – M.: Akademiya, 2008.</p> <p>20. G. C. Goodwin, S. F. Graebe, M. E. Salgado, Control System Design Engineering. - M.: Binom, 2008.</p> <p>21. V. B. Steshenko. Practice of Computer-Aided Design of Electronic Devices. – Moscow: Nolidzh, 2012.- 768 p.</p> <p>22. V. D. Suchkov P-CAD 2001 Design System. – M.: SOLON-R, 2001 – 435 p.</p> <p>23. Computer Technologies in Science, Education and Production of Electronic Technology: Textbook / V. V. Kruchinin, Y. N. Tanovitsky. - 2017. – 134 p. 4.</p> <p>24. D. Y. Muromtsev, I. V. Tyurin. CAD Mathematical Support. – M.: Lan, 2014. – 464 p.</p> <p>25. V. G. Olifer, N. A. Olifer. Computer Networks. Moscow, 2010</p> <p>26. M. Palmer, R. Sinclair. Design and Implementation of Computer Networks. St. Petersburg, 2011</p> <p>27. D. Sklyar, A. Trachtenberg. PHP. Programming Recipes. 2nd ed.: Trans. from English, M.: Russkaya Redaktsiya Publishing House, 2007 – 736 p.</p> <p>28. L. D. Sleptsova, Y. M. Bidasyuk. JavaScript. Tutorial. M.: Williams Publishing house, 2007 – 448 p.</p> <p>29. Y. K. Rozanov, M. V. Ryabchitskiy, A. A. Kvasnyuk. Power Electronics. - M: Publishing house of MPEI, 2009.</p> <p>30. Rama Reddy S. Basics of Power Electronics. - M: Tekhnosfera, 2006.</p> <p>31. Radio automatics: textbook. allowance / V.N. Bondarenko, V.N. Tyapkin, D.D. Dmitriev [i dr.]; ed. V.N. Bondarenko. – Krasnoyarsk: Sib. feder. un-t. - 2013. - 172 p.</p> <p>32. Radio automatics: textbook / V. P. Pushkarev, D. Yu. Pelyavin. - Tomsk: TUSUR, 2018. - 182 p.</p> <p>33. Theoretical foundations of radioautomatics: textbook. allowance / B.V. Skvortsov, A.V. Parshina. - Samara: Publishing House of Samara University, 2018. - 196 p.</p>
Date of last amendment	20.01.2023

Module Name:	Module 21: Technologies of Technogenic Risk Management
Code	M21REET(Ba)
Module Elements:	<i>Elective Subjects</i> Basics of Law and Anti-Corruption Culture/Basics of Financial Literacy/ Economic and Business Studies/ Power Saving Technologies in Modern Industries/Ecology and Sustainable Development/Information and Quality Management/Health and Safety Basics
Semester Number:	4
Person responsible for the module	V.V. Savinkin
Lecturer:	Basics of Law and Anti-Corruption Culture – D.T. Konyrbayeva Basics of Financial Literacy – O.A. Tsapova Economic and Business Studies – I.A. Shinkaryov Power Saving Technologies in Modern Industries – V.V. Savinkin Ecology and Sustainable Development – S.B. Baybusinova Information and Quality Management – T.P. Kovshova Health and Safety Basics – T.S. Zvyarechenko
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	4 semester: hours per week – 6 (lectures -2; independent work -4); hours per semester – 90.
Workload:	Teaching Load: 30 hours Extracurricular Classes: 60 hours Total: 90 hours
Credit Points:	3 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for each subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the school of Geography; Basics of Life Safety; People. Society. Right.
Expected Learning Outcomes:	Know: theoretical basics and main concepts of humanitarian, economic and natural sciences, data and communication technologies that contribute to the formation of a highly educated person with a broad outlook and culture of thinking; Be able to: use humanitarian, economic, legal and natural science knowledge in the modern information space; Possess the skills: search, analysis, evaluation, work with sources and use of humanitarian, economic, legal and natural science knowledge for personal and professional development; Demonstrate the ability to: use the tool of historical analysis, knowledge of information and communication technologies for better solutions of professional problems, the basics of philosophical knowledge for the formation of scientific worldview and economic thinking to solve situational and practical problems.
Intendend use/applicability	Professional activity
Content:	<i>Basics of Law and Anti-Corruption Culture</i> Basics of constitutional, criminal, administrative, labour and family law of the Republic of Kazakhstan. Theoretical and methodological basis of the concept of corruption. <i>Basics of Financial Literacy</i>

	<p>Planning of capital investments and cash flows. Long-term and short-term sources of funding.</p> <p><i>Economic and Business Studies</i></p> <p>Introduction to Economics. Entrepreneurship and business. Money circulation and turnover. Functioning of markets. Business planning.</p> <p><i>Power Saving Technologies in Modern Industries</i></p> <p>Power industry, energy saving and energy resources. Types, methods of production, conversion and use of energy. Energy management.</p> <p><i>Ecology and Sustainable Development</i></p> <p>Ecology of individuals, populations and communities. The concept and principles of sustainable development.</p> <p><i>Information and Quality Management</i></p> <p>Elements of organizations and management process. Basics of quality management. Information management – basic concepts.</p> <p><i>Health and Safety Basics</i></p> <p>Legislative and legal acts in the field of safety and life. Protection of people and environment from harmful and dangerous factors of natural and man-made origin. Classification of hazardous and harmful factors.</p>
Examination Form, module mark:	<p><i>Basics of Law and Anti-Corruption Culture / Basics of Financial Literacy / Economic and Business Studies / Power Saving Technologies in Modern Industries / Ecology and Sustainable Development / Information and Quality Management / Health and Safety Basics</i> – computer-based testing</p> <p>Module mark: the result of the exam <i>Basics of Law and Anti-Corruption Culture / Basics of Financial Literacy / Economic and Business Studies / Power Saving Technologies in Modern Industries / Ecology and Sustainable Development / Information and Quality Management / Health and Safety Basics</i></p>
Technical/Multimedia Facilities:	Multimedia system.
Study Materials:	<ol style="list-style-type: none"> 1. K. S. Birzhanova, K. B. Ibrayeva. Basics of Law of the Republic of Kazakhstan. - Almaty: Almaty kitap baspasy, 2013. 2. R. Y. Dzhanshanlo. Analysis of Cash Flows of the Organization: Textbook / R. Y. Dzhanshanlo. - Almaty: Lem, 2015. 3. Y. F. Borisov, A. A. Petrov, T. Y. Berezkina. Economics: Textbook for Bachelors. - M.: Prospekt, 2013. 4. Fundamentals of Energy Conservation: Textbook / N.I. Danilov, Y. M. Schelokov. Yekaterinburg: GOU VPO UGTU - UPI, 2015. 5. T. A. Hwang, P. A. Hwang. Ecology: Short Course. - Rostov-on-Don: Phoenix, 2012. 6. A.V. Kostrov. Basics of Information Management: Textbook M.: Finance and Statistics, 2008. 7. Y. D. Vishnyakov. Life Safety. Protection of Population and Territories in Emergency Situations: Textbook. - M: Akademiya, 2012.
Date of last amendment	20.01.2023

Module Name:	Module 22: Modules of modern electronic equipment
Code	M22REET(Ba)
Module Elements:	<i>Elective Subjects</i> Process Sensors Measuring Signal Transducers Information Theory Steady State Radio Engineering Integrated and Microprocessor Devices Radio Transmitters; Smart-City Power Sources Power Supply of Radio Electronic Devices and Systems
Semester Number:	6
Person responsible for the module	S.S. Moldakhmetov
Lecturer:	Process Sensors – Y.M. Dariy Measuring Signal Transducers – A.A. Kashevkin Information Theory – S.S. Moldakhmetov Steady State Radio Engineering – S.S. Moldakhmetov Integrated and Microprocessor Devices – P.A. Petrov Radio Transmitters – P.A. Petrov Smart-City Power Sources – S.S. Moldakhmetov Power Supply of Radio Electronic Devices and Systems – A.A. Savostin
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	6 semester: hours per week – 28 (lectures -3; workshops -2; labs-4; independent work -19); hours per semester – 420.
Workload:	Teaching Load: 135 hours Extracurricular Classes: 285 hours Total: 420 hours
Credit Points:	14 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Design of Electronic Devices, Analysis and synthesis of electrical circuits, Basics of Electrical Engineering
Expected Learning Outcomes:	Know - types and classification of primary measuring transducers (PMP), their principles of operation and properties; - amplifiers for normalizing the signals from the transducers; – principles of interfacing with data collection system; - basics of mathematical analysis of physical processes in analog and digital signal processing devices; - methods of transmission, reception and processing of signals; - theoretical basics, elements and methods of digital device design; - architecture of microcontrollers and microprocessors of well-known foreign companies; - devices and principles of operation of microprocessors, principles of software and methods of design of hardware and software of microprocessor systems; - physical and mathematical models of processes and phenomena underlying the principles of radio engineering devices and systems;

	<ul style="list-style-type: none"> - modern element base used for the construction of radio transmitters and power supply devices; - types and principle of operation of energy sources used in Smart-city; <p>Be able to</p> <ul style="list-style-type: none"> - analyze and develop structural and schematic diagrams of hardware systems for collecting information; - choose the PMP basing on the requirements of technical specifications and controlled physical or technical value; - choose the correct circuit to enable the PMP in order to maximize the output information signal; - use modern means and methods of collection, processing, storage and output of information in solving various technical problems; - apply methods of optimal solutions theory in designing radiosystems of information transfer, in radiolocating and radio-navigation systems; - analyze the structure and properties of devices and systems of analog and digital information processing; - calculate the parameters of digital devices and building circuits; - assemble and install electronic devices; - make simple block diagrams of microcontrollers algorithms; - write programs for microcontrollers; - calculate the parameters of the schemes of radio transmitting and power supply devices; - adjust and measure the basic electrical parameters of certain devices for generating, shaping and processing of radio signals; - select power supply devices for radio engineering and telecommunication systems; <p>Possess the skills</p> <ul style="list-style-type: none"> - design prototypes and experimental measurement systems; - selection of different statistical methods of analysis of radio systems; - design and adjustment of analog, digital and microprocessor devices; - firmware upgrade of microcontrollers using the programmer; - analysis of the functioning of certain units of modern equipment and devices; - design and calculation of power supply devices and main blocks of shaping and transmission of radio signals; - application of a program for calculations of parameters and properties of power supply devices and devices for shaping and transmission of radio signals <p>Demonstrate the ability</p> <ul style="list-style-type: none"> - to use the capabilities of sensors to solve various types of problems (measurement of signals time, shaping signals with specified time properties, voltage measurement, collection, storage and transmission of data, control actuators); - to apply methods of analysis and synthesis of analog and digital signal processing devices in the field of speech, sound and image processing; - to search and analyze scientific and technical information and select the necessary components to create power supply devices and devices for shaping and transmission of radio signals;
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	- to select materials and components for the creation of power supply devices and devices for the formation and transmission of radio signals depending on the operating conditions.
Intendend use/applicability	Module: Design of electronics, control and communication systems
Content:	<p><i>Process Sensors</i> Principles of construction and types of primary measuring transducers. Main properties of the measuring transducers. Methods and means of generating output electrical signals in measuring transducers.</p> <p><i>Measuring Signal Transducers</i> Information basics of measurements. Measuring channels. Measuring signals. Measuring converters of electrical quantities.</p> <p><i>Information Theory</i> General provisions on data transmission. Analog and digital signals. Modulation of signals. Manipulation of digital signals. Coding of signals. Deterministic and random signals. Entropy. Devices for transmitting and receiving data. Communication channels.</p> <p><i>Steady State Radio Engineering</i> Basic concepts of probability theory. Probabilistic models of signals and interference in radio systems. Linear transformations of random processes. Optimal signal filtering. Detection of discrete signals. Detection of fully known analog signals. Application of the theory of evaluation in radio engineering. Signal discrimination and resolution.</p> <p><i>Integrated and Microprocessor Devices</i> Electrical properties of semiconductor materials. Semiconductor devices. Analog integrated circuits. Digital integrated circuits: logic units of combinational type, microprocessors, microprocessor systems.</p> <p><i>Radio Transmitters.</i> Radio Transmitters on semiconductor devices. Oscillators and frequency synthesizers. Equipment of the transmitting station. Basic concepts of maintenance of radio transmitters.</p> <p><i>Smart-City Power Sources</i> Types of sources and their principles of power used for Smart - city. Modern solutions in the field of control and management of energy consumption.</p> <p><i>Power Supply of Radio Electronic Devices and Systems</i> General properties of secondary power sources. Electrical devices. Special types of transformers. Rectifiers. Load operation of the rectifier. Smoothing filters. Controls in secondary power supply sources.</p>
Examination Form, module mark:	<p><i>Process Sensors</i> – written examination <i>Measuring Signal Transducers</i> – written examination <i>Information Theory</i> - written examination <i>Steady State Radio Engineering</i> - written examination <i>Integrated and Microprocessor Devices</i> - free-form examination <i>Radio Transmitters</i> – free-form examination <i>Smart-City Power Sources</i> – written examination <i>Power Supply of Radio Electronic Devices and Systems</i> – free-form examination Module mark: free-form examination <i>Elective Subject</i></p>
Technical/Multimedia Facilities:	Multimedia system. Laboratory of Automation and Electrical

	Safety. Laboratories of Radio Engineering Telecommunication Systems and Devices, Digital Communication Systems and Radio Receiving and Transmitting Devices, Digital Devices and Microprocessors, Microcontrollers and Special Microprocessors.
Study Materials:	<ol style="list-style-type: none"> 1. J. Freiden. Modern Sensors. Reference Book./ J. Freiden. – M: Tekhnosfera, 2005. – 592 p. 2. H. M. Hashemian, Process Sensors. Properties and Methods to Improve Reliability; Binom - Moscow, 2008. - 336 p. 3. V. I. Tikhonov. Statistical Analysis and Synthesis of Radio Engineering Devices and Systems. – M: Radio i svyaz: Goryachaya liniya-Telekom, 2004. 4. G. I. Khudyakov. Statistical Theory of Radio Engineering Systems. – M: Akademiya, 2009. 5. L. M. Goldenberg Pulse and Digital Devices / L. M. Goldenberg. - Moscow: Ogni, 2009. - 496 p. 6. V. I. Boyko. Microprocessors and Microcontrollers. –SPb.: BHV-Petersburg, 2004. 7. AVR microcontrollers. Course Book for Beginners : textbook/V. Y. Hartov. – 2nd ed., Updated and revised. – Moscow: MGTU Publishing house, 2012. 280 p. 8. A. K. Naryshkin. Digital Devices and Microprocessors. – M: AKADEMIYA, 2006. 9. Y. V. Novikov. Introduction to Digital Circuit Design. –M.: BINOM. 2007. 10. V. V. Shakhgildyan. Radio Transmitters. – M: Radio i svyaz, 2003. 11. V. I. Kaganov. Radio Transmitters. – M: AKADEMIYA, 2002. 12. V. V. Shakhgildyan. Development of Radio Transmitters. – M: Radio i svyaz, 2001. 13. G. M. Utkin. Devices of Generation and Formation of Radio Signals – M.: Radio i svyaz, 2001. 14. V. M. Bushuyev, V. A. Deminskiy et al. Power Supply of Telecommunication Devices and Systems. – M.: Goryachaya liniya - Telekom, 2009. 15. Y. N. Geytenko. Secondary Power Sources. Textbook for universities. – M.: SOLON-PRESS, 2008.
Date of last amendment	20.01.2023

Module Name:	Module 23: Design of electronics, control and communication systems
Code	M23REET(Ba)
Module Elements:	<i>Elective Subjects</i> Antenna-Feeder Devices MicrowaveDevices Basic of Smart-City Hardware and Software System Design Robotic Systems Smart Technologies in Telecommunication Networks and Systems System Design based on Programmable Logic Integrated Circuits Artificial Intelligence Systems Electromagnetic Capability; Radio Receivers <i>Compulsory Subjects</i> Work Experience Internship2
Semester Number:	6
Person responsible for the module	D.V. Ritter
Lecturer:	Antenna-Feeder Devices – D.V. Ritter MicrowaveDevices – P.A. Petrov Basic of Smart-City Hardware and Software System Design – S.S. Moldakhmetov Robotic Systems – P.A. Petrov Smart Technologies in Telecommunication Networks and Systems – A.A. Savostin System Design based on Programmable Logic Integrated Circuits – D.V. Ritter Radio Receivers – P.A. Petrov Electromagnetic Capability – A.A. Savostin Artificial Intelligence Systems – V.P. Kulikova Work Experience Internship2 – T.I. Krashevskaya
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	6 semester: hours per week – 24 (lectures -3; workshops -3; labs-3; independent work -15); Work Experience Internship 2 - 120 hours per semester – 480.
Workload:	Teaching Load: 135 hours Extracurricular Classes: 225 hours Work Experience Internship 2 – 120 hours Total: 480 hours
Credit Points:	16 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Basics of Electrical Engineering, Design of Electronic Devices, Modules of modern electronic equipment
Expected Learning Outcomes:	Know: - methods of transmission, reception and processing of signals; - technical methods for the creation (generation and formation) of electrical signals used in radio engineering for radio and television;

	<ul style="list-style-type: none"> - models, types and varieties of antenna-feeder devices, features of modern radio transmission technologies; - basic conceptual apparatus and the role of antenna-feeder devices in television, radio relay lines and communication; - principles of design and calculation of antenna-feeder devices; - principles of construction of modern radio engineering and telecommunication systems; - basic telecommunication technologies, types of equipment used in networks, signaling protocols of modern networks, principles of multiservice networks, principles of network management; - physical and mathematical models of processes and phenomena underlying the principles of radio engineering devices and systems; - modern element base used for the construction of radio receivers; - theoretical bases and principles of programming in radio electronics; - basics of hardware and software development of modern automatic control systems; - classification of AIS, models of knowledge representation, output solutions and communication models in AIS; - structure and application of neural networks; - basic concepts of fuzzy sets; - principles of electromagnetic compatibility of technical means; - principles of construction of robotic systems; - methods, levels and stages of design; algorithms for designing subsystems of robots. <p>Be able to:</p> <ul style="list-style-type: none"> - calculate antennas and microwave devices of different types; - conduct a full-scale experiment to measure the main indicators and properties of antenna-feeder devices; - adjust and install antennas and microwave devices; - perform calculation and graphic works on design of information, electromechanical, electronic and microprocessor modules of hardware and robotic systems; - calculate the parameters of the schemes of radio receiving devices; - adjust and measure the basic electrical parameters of certain devices for receiving and processing of radio signals; - use measuring equipment for adjustment and testing of electronic devices; - use elements of fuzzy sets for mathematical formalization of initial information about the studied real situation or decision-making process; - assess the electromagnetic environment in the operation of technical means; - use special software for traffic analysis and network monitoring <p>Possess the skills:</p> <ul style="list-style-type: none"> - use software for end-to-end design of antenna-feeder devices; - design of microwave units of electronic equipment; - work with specialized software to create devices and robotic systems using sensors;
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	<ul style="list-style-type: none"> - modeling of hardware-software and robotic systems; - network fault detection and identification; - development technical, schematic and organizational activities for ensuring electromagnetic compatibility; - analysis of the functioning of certain units of modern equipment and devices; <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to operate and maintain modern antenna-feeder devices; - to choose elements of antenna-waveguide equipment taking into account the requirements of miniaturization, reliability, electromagnetic compatibility, manufacturability, maintainability, ease of operation and economic efficiency; - to evaluate various hardware and software and robotic systems for suitability for a specific task; - to understand the wide range of problems associated with the use and prospects of using AIS; - to interpret information on the network statistics; - to administer the simplest network equipment.
Intendend use/applicability	Modules: Modern Communication Systems
Content:	<p><i>Antenna-Feeder Devices</i> Basics of the theory of radio wave propagation. Types of antennas. Feeder devices. Calculation of the antenna radiation field. Antenna pattern. Antenna array. The radiation of the excited surfaces. VHF and HF antennas. Radio relay and satellite communication. Influence of the troposphere and ionosphere on the propagation of radio waves. Tropospheric communication lines.</p> <p><i>Microwave Devices</i> Microwave communication. Mobile networks of the latest generation. IEEE 802.11 standard. 802.15.4 standard. Wireless personal area network. Topology of a personal area network. ZigBee Alliance. Personal Bluetooth and Wi-fi networks. Prospects for the development of wireless networks.</p> <p><i>Basic of Smart-City Hardware and Software System Design</i> Architecture and implementation of hardware and software systems of a Smart city. Modern hardware modules of automatic control systems. Development and debugging of software for automatic control systems.</p> <p><i>Robotic Systems</i> System approach to the design of robotic systems. Design features of robotic systems. Simulation modeling of robots and robotic technological systems.</p> <p><i>Smart Technologies in Telecommunication Networks and Systems</i> Modern telecommunication technologies. Architecture of modern networks. Ethernet. IP-telephony. IPTV. NGN networks. Network management. TMN model.</p> <p><i>System Design based on Programmable Logic Integrated Circuits</i> Design of digital systems. Programmable logic integrated circuits. Synthesis of combinational circuits on the PLD. Synthesis of finite state machines on SPLD. Synthesis of finite state machines on CPLD. Synthesis of programmable automata on PLD. Design of digital systems based on PLD.</p> <p><i>Radio Receivers</i> Technical properties of the radio. Classification of radio interference. High-frequency amplifiers, their purpose and</p>

	<p>properties. Ways to protect radios from interference.</p> <p><i>Artificial Intelligence Systems</i> Mastering the principles of organization and functioning of AIS, as well as practical skills of their design, mastering systematic ideas about the possibilities and areas of use of AIS, their architectural features and means of their creation. Particular attention is paid to the study of methods of obtaining, formalization and structuring of problem knowledge and to storage and use of knowledge in knowledge bases.</p> <p><i>Electromagnetic Capability</i> Basic notions of electromagnetic compatibility. Sources of electromagnetic interference, their classification. Methods of description and presentation of interference. The way of interference penetration (parasitic channels).</p> <p><i>Work Experience Internship2</i> General provisions of the existing technological processes at the enterprise where the practice takes place. A detailed study of one of the shops or departments of the plant. Performance of one of the types of individual tasks: repair and adjustment of equipment (separate units); independent implementation of some stages of the production process of the shop; performance of individual experimental work following the instructions of the Department.</p>
Examination Form, module mark:	<p>Comprehensive examination including</p> <p><i>Antenna-Feeder Devices</i> – free-form examination</p> <p><i>Microwave Devices</i> – free-form examination</p> <p><i>Artificial Intelligence Systems</i> – computer-based testing</p> <p><i>Basic of Smart-City Hardware and Software System Design</i> – computer-based testing</p> <p><i>Robotic Systems</i> – free-form examination</p> <p><i>Smart Technologies in Telecommunication Networks and Systems</i> - written control examination</p> <p><i>System Design based on Programmable Logic Integrated Circuits</i> - computer-based testing</p> <p><i>Radio Receivers</i> – written control examination</p> <p><i>Electromagnetic Capability</i> - written control examination</p> <p><i>Work Experience Internship2</i>– internship report defense</p> <p>Module mark: the result of the report defense <i>Work Experience Internship 2</i></p>
Technical/Multimedia Facilities:	<p>Multimedia system.</p> <p>Laboratory of Antenna-Feeder and Microwave Devices.</p> <p>Laboratory of Computer Mathematics and Electronic Simulation. Research laboratory of Robotics, Microelectronics and Energy Ecology. Laboratories of Radio Engineering Telecommunication Systems and Devices, Digital Communication Systems and Radio Receiving and Transmitting Devices.</p>
Study Materials:	<ol style="list-style-type: none"> 1. B. M. Petrov. Electrodynamics and Propagation Of Radio Waves: Textbook for universities. – M: Goryachaya liniya – Telekom, 2004. 2. A. P. Kashkarov Modern Antennas. – M: Radiosoft, 2013. 3. Karl Rothammel. Antennas. – M: Layt-LTD, 2007. 4. D. I. Voskresenskiy, V. L. Gostyukhin, V. M. Maksimov, L. I. Ponomaryev. Microwave Devices and Antennas. Radiotechnics. – M: Akademiya, 2006. 5. V. I. Nazarov, V. I. Ryzhenko. All about Antennas.

	<p>Reference book. – M.: ONIKS, 2008.</p> <p>6. G. V. Savostina Methodical Guidelines for Professional Practice. – Petropavlovsk: NKSU named after M. Kozybayev, 2014.</p> <p>7. Y. I. Yurevich. Basics of Robotics: Textbook, 2nd ed. - SPb.: BHV-Petersburg, 2005. – 345 p.</p> <p>8. Y. A. Smirnov, S. V. Sokolov, Y. V. Titov. Basics of Microelectronics and Microprocessor Technology. Lan, 2013.</p> <p>9. V. L. Afonin, V. A. Makushkin. Intelligent Robotic Systems. Internet University of Information Technologies, 2005 -208 p.</p> <p>10. V. V. Krukhmalev, V. N. Gordiyenko, A. D. Mochenov. Digital Transmission Systems: Textbook for high schools / Under the editorship of A. D. Mochenov. - M.: Goryachaya liniya - Telekom, 2007.</p> <p>11. Basics of Telecommunication Systems and Networks: Textbook for universities /V. V. Krukhmalev, V. N. Gordiyenko, A. D. Kochenov et al.; Under editorship of V. N. Gordiyenko and V. V. Krukhmalev. - 2nd ed., Rev. - M: Goryachaya liniya - Telekom, 2008.</p> <p>12. V. N. Gordienko. Multichannel Telecommunication Systems: Textbook for high schools / V. N. Gordienko, M. S. Tveretskiy. - M.: GLT, 2013. – 396 p.</p> <p>13. B. I. Kruk Telecommunication Systems and Networks. Textbook in 3 volumes. Volume 1 / B. I. Kruk. - M.: GLT, 2012. - 620 p</p> <p>14. V. V. Solovyev. Logical Design of Digital Systems Based on Programmable Logic Integrated Circuits / Valeriy Vasilyevich Solovyev, Adam Klimovich. - M.: Goryachaya liniya - Telekom, 2014. – 376 p.</p> <p>15. O. V. Golovin. Radio Receivers. – M: Goryachaya liniya-Telekom, 2004.</p> <p>16. A.V. Veligosha. Devices for Receiving and Processing Radio Signals. – Stavropol: North Caucasus Federal University, 2014.</p> <p>17. I. A. Bessmertniy. Artificial Intelligence Systems: Textbook for academic bachelors / I. A. Bessmertniy. – 2nd ed., updated and revised. – M.: Yurayt, 2017. - 130 p.</p> <p>18. Y. Borovskaya. Basics of Artificial Intelligence / Y. Borovskaya. – M.: Binom, 2015. – 128 p.</p> <p>19. M. V. Burakov. Artificial Intelligence Systems. Textbook / M. V. Burakov. – M.: Prospect, 2017. – 440 p.</p> <p>20. Y. Y. Sedelnikov. Electromagnetic Capability of Radio Electronic Equipment. Textbook. - Kazan. ZAO Novoye znaniye, 2016.</p> <p>21. M. P. Bader. Electromagnetic Capability. - M.: Transport, 2008.</p>
Date of last amendment	20.01.2023

Module Name:	Module 24: Modern Communication Systems
Code	M24REET(Ba)
Module Elements:	<i>Elective Subjects</i> Satellite Monitoring Systems in Smart-City Wireless Data Transmission Systems Digital Devices for Signal Generation and Processing Protection and Secrecy of Information Smart Technologies in Information Display Devices and Systems Basics of Television and Video Equipment Radio Engineering Systems Simulation Data Collection and Processing Systems Measurement, Transmission and Control Systems Industrial Safety Electrical Safety Global navigation satellite systems Fundamentals of network technologies WEB Applications Designing
Semester Number:	7
Person responsible for the module	P.A. Petrov
Lecturer:	Satellite Monitoring Systems in Smart-City – P.A. Petrov Wireless Data Transmission Systems – P.A. Petrov Digital Devices for Signal Generation and Processing – V.P. Ivel Protection and Secrecy of Information – S.S. Moldakhmetov Smart Technologies in Information Display Devices and Systems– P.A. Petrov Basics of Television and Video Equipment – D.V. Ritter Radio Engineering Systems Simulation – G.V. Savostina Data Collection and Processing Systems – Y.V. Gerasimova Measurement, Transmission and Control Systems – P.A. Petrov Industrial Safety – T.I. Krashevskaya Electrical Safety – Y.V. Gerasimova Global navigation satellite systems – G.V. Savostina Fundamentals of network technologies– G.V. Savostina WEB Applications Designing – N.V. Astapenko
Language:	Russian, Kazakh
Curriculum relation:	Radio Engineering, Electronics and Telecommunications (Ba)
Type of teaching / number of hours per week and per semester :	7 semester: hours per week – 40 (lectures -4; workshops -4; labs-6; independent work -26); hours per semester – 450.
Workload:	Teaching Load: 210 hours Extracurricular Classes: 390 hours Total: 600 hours
Credit Points:	20 ECTS
Conditions for Examinations:	For admission to the exam, the student must score at least 50 points out of 100 available for the subject of the module
Recommended Conditions:	This module is based on the knowledge gained in the course of the following modules: Receiving and Transmitting Devices, Digital Control Systems, Design of electronics, control and communication systems
Expected Learning Outcomes:	Know: - methods of transmission, reception and processing of signals; - technical methods of generating and shaping of electrical

	<p>signals used for radio and television;</p> <ul style="list-style-type: none"> - principles of construction of modern radio engineering and telecommunication systems; - principles of construction and application of analog and digital devices of various functional complexity; - physical principles of transmission of optical images and technical methods of construction of television systems and video recording systems; - basics of modeling of radio-electronic and telecommunication devices in various virtual environments; - graphic editors for drawing schematic diagrams of electronic devices; - general principles of construction of automatic control systems; - requirements and methods for ensuring internal and external electromagnetic compatibility of radio electronic devices for various purposes; - legal, regulatory and institutional basics of labor protection in the production; - basic definitions and concepts of web-design and programming; - basic techniques of creating and promoting sites; - principles of operation and application of various navigation systems based on satellite technologies, such as GPS, GLONASS, Galileo, BeiDou, NavIC; - theoretical foundations of the architectural and system-technical organization of computer networks, the construction of network protocols, the foundations of Internet technologies. <p>Be able to:</p> <ul style="list-style-type: none"> - calculate the parameters of the signals when they pass through the radio circuit; - analyze the structure and characteristics of devices and systems of analog and digital information processing; - choose a technical solution for the creation of electrical signals used in the transmission of information with the desired characteristics; - work with various packages of application programs popular in the radio engineering industry; - use modern means and methods of collection, processing, storage and output of information in solving various technical problems; - calculate the main properties of radio systems; - apply standards and regulations in the field of electromagnetic compatibility; - organize work in accordance with the current legislation, apply regulatory documentation in the design and operation of radio equipment; - provide safe working conditions in professional activity; - design, develop and promote web-resources and applications; - use GNSS to measure distances, heights, speeds and other parameters, as well as to solve problems of navigation, transport management and other applied tasks. - select, integrate and operate software and hardware in the created computing and information systems and network structures. <p>Possess the skills:</p>
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	<ul style="list-style-type: none"> - application of methods of analysis and synthesis of analog and digital signal processing devices in the field of speech, sound and image processing; - application in practice of the basic provisions of the theory of noise immunity of discrete and analog messages; - checking the functioning, adjustment and control of the main parameters of radio-television equipment; - design, installation and adjustment of analog, digital and microprocessor devices and systems; - application of basic statistical methods of analysis and synthesis in radio systems; - work with normative documentation; - effective use of knowledge and skills in the field of occupational health and safety; - design, development and marketing of web-applications; - use software for data processing of navigation systems; - Network recovery skills. <p>Demonstrate the ability:</p> <ul style="list-style-type: none"> - to design the receiving and transmitting radar-locating, radio navigation and space systems; - to implement the processes of shaping and processing of signals in radio engineering devices and systems; - to apply the methods of the optimal solutions theory in the design of radio systems of measurement, transmission and control; - to be able to make and justify specific technical decisions taking into account the requirements of electromagnetic compatibility, ensuring the necessary level of reliability and safety in the development and use of electronic equipment; - design and create modern Internet applications; - to use the knowledge of the safe operation of electrical equipment in professional activities; - apply knowledge of global navigation systems to solve various problems in various fields and industries; - configure various network equipment.
Intendend use/applicability	Modules: Final Internship, Final Academic Assessment
Content:	<p><i>Satellite Monitoring Systems in Smart-City</i> Classification of satellite systems. Principles of operation of satellite data transmission systems. Area of coverage of satellite systems. Features of satellite orbits. Difference in ranges. Technical properties of satellite systems. Satellite navigation system. Satellite monitoring systems. Intelligent devices using satellite monitoring systems.</p> <p><i>Wireless Data Transmission Systems</i> Classification of wireless communication systems. Classification of radio waves and radio frequency ranges. Channel separation in the transmission of data. Radial networks. Repeater networks. Trunking networks. Cellular network. Mobile network. Satellite network. Wireless LAN.</p> <p><i>Digital Devices for Signal Generation and Processing</i> Discrete signals and their spectra. Discrete systems and methods of their description. Design of digital filters with infinite and finite pulse characteristics. Automation of design of digital filters using specialized software.</p> <p><i>Protection and Secrecy of Information</i> Principles of encryption. Data encryption. Encoders. Coding system. Block codes. Cyclic code. Polynomials. Principles of</p>

	<p>coding in digital data transmission.</p> <p><i>Smart Technologies in Information Display Devices and Systems</i> Information display devices. Indicators. Led indicator. Liquid crystal displays. Plasma panels. Displays with carbon nanotubes. Multimedia technologies. Touch screen. Holographic systems.</p> <p><i>Basics of Television and Video Equipment</i> Properties and parameters of the television picture. Form and spectrum of the television signal. Frame size. Decomposition strings and frame rate. Liquid crystal and LED technologies. Principles of color transmission in television. SECAM and PAL systems. Basics of digital television. Satellite TV broadcasting. Cable TV system.</p> <p><i>Radio Engineering Systems Simulation</i> Models of complex systems. Mathematical and physical simulation of radio engineering devices and systems. Computer-aided design and simulation of radio engineering systems.</p> <p><i>Data Collection and Processing Systems</i> Review and classification of technical means of data processing. Methods of data processing. Classification of technical means of information processing. General properties of a typical approach to the design of data collection and processing systems. Methods of control and error detection.</p> <p><i>Measurement, Transmission and Control Systems</i> General questions of measuring equipment. Basics of the theory of measurement, transmission and control systems. Structure and algorithms of measurement, transmission and control systems. Methods of evaluation of technical properties of measurement, transmission and control systems.</p> <p><i>Industrial Safety</i> Legal, regulatory and organizational bases of labor protection at the enterprise. Harmful and dangerous production and factors. Fire safety in enterprises. Technical security of buildings and structures, equipment and tools, and technological processes.</p> <p><i>Electrical Safety</i> Electrical injuries. Classification of electrical injuries. Norms of voltages and currents passing through the person. Grounding devices of electrical installations and their technical properties. Protective measures in electrical equipment.</p> <p><i>WEB Applications Designing.</i> Theoretical and practical comprehensive consideration of modern client web-development technologies used to create Web-sites.</p> <p><i>Global navigation satellite systems</i> Satellite GNSS systems. GNSS receivers. Geodetic GNSS applications. Navigation applications of the STS. Development and processing of STS data.</p> <p><i>Fundamentals of network technologies</i> Fundamentals of network technologies and the OSI model. The physical layer of network technologies and data transmission. Link level of network technologies and protocols for media access control. Network layer of network technologies and routing protocols. Transport layer of network</p>
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	technologies and data transfer protocols. Network technology application layer protocols, including HTTP, SMTP, FTP, and others. Local area networks (LAN) and Ethernet protocols. Wireless networks (Wi-Fi) and 802.11 standards.
Examination Form, module mark:	<p><i>Satellite Monitoring Systems in Smart-City</i> – computer-based testing</p> <p><i>Wireless Data Transmission Systems</i> free-form examination</p> <p><i>Digital Devices for Signal Generation and Processing</i> – free-form examination</p> <p><i>Protection and Secrecy of Information</i> – free-form examination</p> <p><i>Smart Technologies in Information Display Devices and Systems</i> – written examination</p> <p><i>Basics of Television and Video Equipment</i> – computer-based testing</p> <p><i>Radio Engineering Systems Simulation</i> – written examination</p> <p><i>Data Collection and Processing Systems</i> – written examination</p> <p><i>Measurement, Transmission and Control Systems</i> – free-form examination</p> <p><i>Electrical Safety</i> – Written control work</p> <p><i>Industrial Safety</i> – Written control work</p> <p><i>WEB Applications Designing</i> - free-form examination</p> <p><i>Global navigation satellite systems</i>– written examination</p> <p><i>Fundamentals of network technologies</i>- free-form examination</p> <p>Module mark: free-form examination <i>Elective Subject</i></p>
Technical/Multimedia Facilities:	Multimedia system. IT room. Laboratories of Digital Devices and Microprocessors, and Microcontrollers and Special Microprocessors basing on MK AT90S8535. Laboratory of Computer Mathematics and Electronic Siulation. Research laboratory of Robotics, Microelectronics and Energy Ecology. Laboratory of Radio Engineering Telecommunication Systems and Devices.
Study Materials:	<ol style="list-style-type: none"> 1. A. M. Somov, S. F. Kornev. <i>Satellite Communication System.</i> – M.: Goryachaya liniya - Telekom, 2012. 2. A. I. Abolits. <i>Satellite Communication System.</i> - M.: ITIS, 2014. 3. H. Arslan. <i>Ultra-Wideband Wireless Communication / H. Arslan.</i> - M: Tekhnosfera, 2012. - 774 p. 4. M. A. Bykhovsky. <i>Development of Telecommunications. On the Way to the Information Society. Development of Satellite Telecommunication Systems: textbook for universities.</i> - M.: Goryachaya liniya - Telekom, 2014. 5. V. P. Vasilyev. <i>Basics of the Theory and Calculation of Digital Filters.</i> – M: Akademiya, 2007. 6. A. B. Sergiyenko. <i>Digital Signal Processing.</i> – SPb.: Piter, 2007. 7. R. Y. Bykov <i>Basics of Television and Video Equipment.</i> – M: Goryachaya liniya - Telekom, 2006. 8. Dvorkovich, Viktor Pavlovich. <i>Digital Video Information Systems (Theory and Practice) / V. P. Dvorkovich.</i> – M.: Tekhnosfera, 2012. – 1007 p. 9. A. V. Yakovlev, A. A. Bezbogov, V. V. Rodin, V. N. Simkin. <i>Cryptography: Textbook.</i> - Tambov: TSTU Publishing House, 2006. - 140 p. 10. M. Y. Lishak. <i>Electronic Equipment Design Automation.</i>

	<p>– M: Vysshaya Shkola, 2000.</p> <p>11. Y. A. Bogatyrev, Y. A. Grebenko. Circuit Simulation of Electronic Devices. – M.: MEI Publishing house, 2007.</p> <p>12. A. Vasin. Radio Systems of Information Transmission. – M.: Goryachaya liniya - Telekom , 2005.</p> <p>13. V. A. Kaplun, Y. A. Brammer, Electronic Devices and Elements of Radio Systems. - M: Vysshaya Shkola, 2002.</p> <p>14. P. Rob, K. Coronel. Database Systems: Design, Implementation and Management. - SPb.: Piter, 2004.</p> <p>15. Y. V. Mikheyeva Information Technologies in professional Activity. – M: Akademiya, 2004.</p> <p>16. V. N. Chentsova. Basics of Occupational Safety. – SPb.: SPBGUEF, 2004.</p> <p>17. I. V. Geits. Labor Protection. – M.: Delo i servis, 2006.</p> <p>18. A. A. Razdorozhniy. Occupational Health and Safety. – M: Egzamen, 2006.</p> <p>19. Y. A. Lapshin. Labor Protection. - Ulyanovsk: Ulyanovskiy Press House, 2008.</p> <p>20. B. I. Zotov, V. I. Kurdyumov. Safety at Work. - M: Kolos, 2009.</p> <p>21. V. G. Olifer, N. A. Olifer. Computer Networks. Moscow, 2010</p> <p>22. M. Palmer, R. Sinclair. Design and Implementation of Computer Networks. St. Petersburg, 2011</p> <p>23. Mikrin, E. A. Orientation, insertion, rendezvous and descent of spacecraft according to measurements from global satellite navigation systems. - Moscow Publishing house of MSTU im. N. E. Bauman, 2017</p> <p>24. Yatsenkov V.S. Fundamentals of satellite navigation. GPRS and GLONASS systems. - M: Hotline - Telecom, 2005</p> <p>25. Soloviev Yu.A. Satellite navigation systems. - M.: Eco_Trenz, 2000</p> <p>26. Olifer V.G., Olifer N.A. Computer networks: principles, technologies, protocols. Textbook. SPb. "Peter", 2020</p> <p>27. Broido V. Computing systems, networks and telecommunications - St. Petersburg. "Peter", 2004</p> <p>28. Pyatibratov A.P., Gudyno L.P. Computing systems, networks and telecommunications. M.: Finance and statistics, 2015</p>
Date of last amendment	20.01.2023