**The educational program «7M05303-Technical Physics» was developed on the basis of:**

–Law of the Republic of Kazakhstan dated July 27, 2007 No. 319-III "On Education" (with amendments and additions as of 03/31/2021),

– Law of the Republic of Kazakhstan dated July 11, 1997 No. 151-I. "On languages in the Republic of Kazakhstan" (with amendments and additions as of 24.05.2018).

– The State Mandatory Standard of Higher Education dated August 31, 2018 No. 604 (with amendments and additions dated May 05, 2020, No. 182).

– The National Qualifications Framework of March 16, 2016 by the Republican Tripartite Commission on Social Partnership and Regulation of Social and Labor Relations.

– Order of the Ministry of Education and Science of the Republic of Kazakhstan "On approval of the Rules for the organization of the educational process on credit technology" dated October 2, 2018 No. 152 (with amendments and additions dated 12.10.2018 No. 563).

– Classifier of training areas with higher and postgraduate education dated 13.10.2018 No. 569.

**Content:**

|  |  |  |
| --- | --- | --- |
| **№** | Passport of the educational program | **Страницы** |
| 1 | Code and name of the educational program | 4 |
| 2 | Code and classification of the field of education, areas of training | 4 |
| 3 | Group of educational programs | 4 |
| 4 | Volume of loans | 4 |
| 5 | Form of training | 4 |
| 6 | Language of instruction | 4 |
| 7 | Degreeawarded | 4 |
| 8 | Type of EP | 4 |
| 9 | Level according to the ISCE | 4 |
| 10 | Level according to the NQF | 4 |
| 11 | Level according to the IQF | 4 |
| 12 | Distinctive features of the EP | 4 |
|  | Partner University (JEP) | 4 |
|  | Partner University(TDEP) | 4 |
| 13 | The number of the appendix to the license for the direction of training | 4 |
| 14 | The name of the accreditation body and the validity period of the accreditation EP | 4 |
| 15 | Purpose of the EP | 4 |
| а) | Qualification characteristics of the graduate | 4 |
| b) | List of graduatepositions | 5 |
| c) | Scope and objects of professional activity of the graduate | 5 |
| d) | Types of professional activity of the graduate | 5 |
| 16 | Functions of the graduate's professional activity | 5 |
| 17 | Formulation of learning outcomes based on competencies | 6 |
| 18 | Determination of modules of disciplines in accordance with the results of training | 8 |
| 19 | Matrix of achievability of learning outcomes | 9 |
| 20 | Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module | 13 |
| 21 | GraduateModel | 14 |

**Passport of the educational program**

**1. Code and name of the educational program:** "7M05303-Technical Physics "

**2. Code and classification of the field of education, training areas:** 7M05Natural sciences, 7M053Physical and chemical sciences

**3. Group of educational programs:** M090-Physics

**4. Volume of credits**: 120 ECTS.

**5. Form of study**: full-time

**6. Language of instruction**: Kazakh, Russian

**7. Degree awarded** Master of Technical Sciences in the educational program 7M05303- Technical Physics

**8. Type of EP:** the current EP is an educational program, according to which training is carried out at the university.

**9. ISCE level** (International Standard Classification of Education) – level 7.

**10. The level of the NQF** (National Qualifications Framework) - level 7.

**11. IQF level** (Industry Qualifications Framework) – level 7.

**12. Distinctive features of EP**: - no

**13. Number of the appendix to the license for the direction of personnel training:** No. 016 KZ 83LAA00018495 dated 07/28/2020.

**14. The name of the accreditation body and the validity period of the accreditation of the EP**: Certificate of international accreditation of educational programs of NAOKO SA-A No. 0174/2 dated December 23, 2019-December 20, 2024.

**15. The purpose of the EP:**The main purpose of the educational program of training masters in the educational program "7M05303 - Technical physics" - the organization of high-quality training of masters as highly qualified and competitive professionals in demand by the domestic education system and motivated to research activities.

**a) Qualification characteristics of the graduate:** the graduate of the master's degree is awarded the degree of Master of Technical Sciences in the educational program "7M05303-Technical Physics".

**b) List of graduate positions:** The sphere of professional activity of graduates of the educational program of Technical physics is the field of science and technology, including research, development, creation and operation of new materials, technologies, devices and devices.

**c) The scope and objects of professional activity of graduates** in this The sphere of professional activity of graduates of the educational program of Technical physics is the field of science and technology, including research, development, creation and operation of new materials, technologies, devices and devices.The objects of professional activity of masters 7M07104- Heat Power Engineering are:

- at scientific and pedagogical preparation – research institutes, scientific centers, research laboratories, design and design bureaus, firms and companies, higher educational institutions, state educational institutions and enterprises of education, and also non-state educational organizations, ministries, public administration bodies of the corresponding profile, the organization of system of education of higher Education institutions and colleges.

- physical processes and phenomena, physical and physical-technological devices, systems and complexes, methods and methods of their research and design.

**d) Types of professional activities**The subjects of professional activity of graduates of the educational program of Technical physics are:

- construction of mathematical models of objects of research and the choice of a numerical method for their modeling, the development of a new or a choice of a ready algorithm for solving problems;

- development of functional and structural schemes, complexes and systems, taking into account the physical principles of their operation, and the establishment of technical requirements;

- development and implementation of technological processes.

- development, creation and operation of devices;

- methods of analysis, forecasting and management of properties of materials, technological processes, technical equipment and operation of production and research facilities of high technologies.

**16. Functions of the graduate's professional activity**

Under the guidance of a leading (senior) engineer, a responsible executor or the head of the topic (task), a master's student performs: participates

in learning activities:

- formulation of tasks and plan of scientific research in the field of technical physics on the basis of bibliographic work with the use of modern information technologies;

- implementation of mathematical modeling and optimization of object parameters with the help of developed and available research and design tools, including standard and specialized application software packages;

- implementation of adjustment, adjustment and experimental check of physical devices, systems and complexes;

- design and construction of various types of systems, units and equipment.

- implementation of collection, processing, analysis and systematization of scientific and technical information on research and development topics;

- study of special literature and other scientific and technical information, achievements of domestic and foreign science and technology in the field of technical physics;

- participation in carrying out pilot studies on a given program, preparation of descriptions of experiments, preparation of data for reports, reviews and other documentation;

- participation in the development and development of technological processes in the preparation of new products;

- participation in the organization of quality control of materials and products, their certification.

**17. Formulation of learning outcomes based on competencies**

|  |  |  |
| --- | --- | --- |
| **Type of competencies**  1. Behavioral skills and personal qualities:  ((Soft skills) | **Learning resultcode** | **Learning result (according to Bloom's taxonomy)** |
| LR 1 | Has the ability to use in research activities in the professional direction of knowledge of traditional and modern problems of history and philosophy of science. |
| LR 2 | Able to choose the best and most effective forms of organization of the educational process in higher education. |
| LR3 | He is able to use the basic provisions and methods of psychological science of management in professional activities. |
| LR 4 | Able to adapt to the specific conditions of the organizations of different organizational and legal forms. |
| LR 5 | Fluent in foreign languages at a level that allows effective interaction in the professional and scientific environment, transmits the results of research in the form of specific recommendations in terms of technical physics. |
| 2. Digital competencies: (Digital skills): | LR6 | He is able to use in cognitive and professional activities the basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations. |
| LR7 | Owns the scheme of the organization of scientific research, the practice of using methods of scientific knowledge in the field of innovation in natural science, technical and technological research. |
| LR 8 | Able to analyze the physical principles of operation, the main characteristics of optoelectronic emitters and photodetectors. |
| LR 9 | Able to correctly Express physical ideas, quantify and solve physical problems. |
| LR 10 | Able to explain the principles of operation of spintronics devices, spin transistor device, spin valve and spin emitting diode. |
| 3. Professional competencies: (Hard-skills) | LR11 | He has the skills to work on laser devices and the use of laser technology to solve scientific and applied problems. |
| LR12 | Owns techniques for the identification and implementation of new energy-efficient technologies in various sectors of the economy, as well as non-traditional and environmentally friendly energy sources. |
| LR13 | It is able to simulate various physical processes using modern programming tools. |
| LR14 | Owns the basic principles of construction of structural schemes of telecommunication systems, semiconductor devices for various purposes. |
| LR 15 | Owns the basic principles of construction of structural schemes of telecommunication systems, semiconductor devices for various purposes. |

**18. Determination of modules of disciplines in accordance with the results of training**

|  |  |  |  |
| --- | --- | --- | --- |
| **Learning resultcode** | **Name of the module** | **Name of disciplines** | **Volume(ECTS)** |
| LR 1 | Philosophical and historical aspects of social and humanitarian knowledge | History and philosophy of science | 3 |
| Higher School Pedagogy | 3 |
| Psychology of management | 3 |
| Teachingpractice | 6 |
| LR 2 | Professionallanguages | Foreignlanguage (professional) | 5 |
| Professional foreign terminology in technical physics Theory and methodology of preparation of a scientific publication in a foreign language | 5 |
| LR3 | The innovation process the organization of scientific research | Commercialization of the results of scientific and technical activities Advanced technologies in micro and nanoelectronics | 5 |
| Innovation in science, technology and technology research Functional electronics | 5 |
| LR 4 | Fundamental principles of modern physics | Physical fundamentals of electronics | 4 |
| Selected chapters of modern physics | 4 |
| Basics of spintronics |  |
| LR5 | Modern problems of technical physics | Introduction to lasertechnology (in English) | 4 |
| Energy-saving technologies in power supply | 3 |
| Computer modeling of physicalprocesses using MathCAD (in English) | 3 |
| Basics of telecommunications(in English) | 3 |
| Semiconductors electronics (in English) | 4 |
| Physics of rheological fluids | 4 |
| LR6 | The scientific research work of the undergraduate, including the performance of the master | The scientific research work of the undergraduate, including the performance of the master | 4 |
| LR7 | Modernproblems of technicalphysics | Research | 24 |
| 14 |
| LR8 | Final examination (FE) | Formalization and defense of the master | 12 |

**19. Matrix of achievability of learning outcomes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NN | Name of disciplines | Briefdescription of the discipline | Number  of credits | Generatedlearningresults (codes) | | | | | | | | |
| **LR 1** | **LR 2** | **LR 3** | **LR 4** | **LR 5** | **LR 6** | **LR 7** | **LR 8** | **LR 9** |
| Cycle of basicdisciplines  University component | | | | | | | | | | | | |
| D 1 | History and philosophy of science | The history and philosophy of science as the study of the general laws of scientific knowledge in its historical development and changing socio-cultural context. Philosophy of science and methodology of science. Science as a cognitive activity and tradition, as a social institution and as a special sphere of culture. Science in the culture of moderncivilization. | 4 | + |  |  |  |  |  |  |  |  |
| D 2 | Higher school pedagogy | The pedagogy of higher education is designed to put on a scientific basis both the solution of the problem of higher education for specific specialties, and the development by undergraduates in their future professional activities of managing the process of mastering this content. The pedagogy of higher education allows us to scientifically substantiate the requirements for the modern educational process and identify its regularities. | 4 | + |  |  |  |  |  |  |  |  |
| D 3 | ManagementPsychology | Formation of systemic ideas about the psychological laws of managerial activity, in revealing the specifics of the use of socio-psychological knowledge in the structure of the manager's activity, in mastering the skills of analyzing the socio-psychological principles underlying effective management. Course content: basic concepts, theoretical positions and actual problems of management psychology; theoretical features of management psychology. | 4 | + |  |  |  |  |  |  |  |  |
| D 4 | Pedagogicalpractice | The purpose of pedagogical practice is a component of professional preparation for scientific and pedagogical activity in a higher educational institution (university) and is a type of practical activity of doctoral students in the implementation of the educational process in higher education, including the teaching of special disciplines, the organization of educational activities of students, scientific and methodological work on the subject, obtaining skills and practical teaching skills. | 4 | + |  |  |  |  |  |  |  |  |
| D 5 | Foreignlanguage (professional) | The purpose of studying the discipline implies the use of a foreign language as a means of professional communication, the use of lexical, grammatical, speech, communicative, sociocultural features of a foreign language for oral and written communication in the professional sphere, the development of techniques and methods of solving communicative tasks in the field of business communication, search and generalization of professional information, work with reference and information resources in a foreign language. | 5 |  | + |  |  |  |  |  |  |  |
| D 6 | Organization and planning of scientific research in thermal power engineering | The purpose of the discipline is the stages of research work, the basics of scientific knowledge and creativity, the accumulation and processing of scientific and technical information, the organization of work in scientific libraries and libraries of research institutes; processing of the data obtained using modern methods, modern experimental research methods, formalization of the results of scientific work, writing a scientific article or a brief informational message. | 4 |  |  |  |  | + |  |  |  |  |
| D 7 | Scientific and technical problems of heat power engineering and heat technologies | The course considers an introduction to the problems of modern experimental studies of thermal power and thermal engineering processes; methods of planning and conducting scientific experiment; the use of modern methods and instruments for measuring parameters of thermal engineering processes; methods of processing the results of scientific experiments using computer technologies. | 4 |  |  |  |  | + |  |  |  |  |
| D 8 | Information systems in heat power engineering and heat technology | The purpose of the discipline "Information systems in heat power engineering and heat technologies" includes the following main sections: Information, its characteristics. The emergence of information technology. Information processes in thermal power engineering. Technical means of information technologies in thermal power engineering. Software tools of information technologies. Technologies for processing textual and numerical information. Technologies for storing and searching information. Network technologies of informationprocessing. | 4 |  |  |  |  | + |  |  |  |  |
| Cycle of basicdisciplines  Component of choice | | | | | | | | | | | | |
| D 9 | Professional foreign terminology in engineering | The purpose of the discipline is to know foreign terminology in thermal power engineering. Able to show foreign language competence when working in an interdisciplinary team. Applies knowledge of foreign terminology in thermal power engineering at a professional level when reading foreign literature. Collects information when conducting a literary review on the research topic. It is possible to transmit the result of the conducted research in the form of specific recommendations in terms of thermal power engineering. | 5 |  | + |  |  |  |  |  |  |  |
| Foreign terminology in alternative energy | The purpose of teaching the discipline is to acquire students' knowledge about the modern approach to energy problems based on new technologies widely used in world practice, the ability to competently and rationally use power plants, possess the necessary knowledge to participate in the development of automated production management systems involving computer technology, as well as in modernization production. |  | + |  |  |  |  |  |  |  |
| D 10 | Commercialization of the results of scientific and scientific-technical activities | The purpose of the discipline is to study the process of commercialization of the results of scientific and intellectual activity, attracting investments, introducing developments into production and their further support. | 5 |  |  | + |  |  |  |  |  |  |
| Theory and technique of scientific experiment | The purpose of teaching the discipline is to study the basics of metrology and measuring technology, to form knowledge, skills and abilities in the field of modern methods and means of conducting scientific and industrial experiments in the field of thermal power engineering. |  |  | + |  |  |  |  |  |  |
| D 11 | Innovation in thermal power engineering | The purpose of the discipline is to understand the essence of innovation and the features of innovation processes; readiness to develop and implement methodological models, techniques, technologies and teaching methods, to analyze the results of the process of their use in organizations engaged in educational activities. | 5 |  |  | + |  |  |  |  |  |  |
| Technology and methodology of scientific labor organization in thermal power engineering | The main purpose of the course is to train a specialist in the field of solving problems of design, research and operation of heat and power and heat technology installations and systems capable of analyzing the efficiency of energy conversion schemes, assessing the prospects of new methods of energy production, putting into practice innovative developments. | 5 |  |  | + |  |  |  |  |  |  |
| D 12 | Modern metering and control devices of thermal energy | The purpose of the discipline is to train specialists in working with thermal energy metering devices. | 4 |  |  |  | + |  |  |  |  |  |
| Integrated use of renewable energy sources | The purpose of the discipline is to train specialists who are able to set and solve tasks involving the use of renewable energy sources in the energy balance of the country and the region, the result of which should be all-round energy conservation in industry and housing and communal facilities and improvement of environmental conditions. |  |  |  | + |  |  |  |  |  |
| D 13 | Basic principles and problems of modern wind energy | Students should master the discipline at a level that allows them to freely navigate the technologies of processing and using renewable energy sources; choose energy equipment according to technical catalogs; develop autonomous power supply systems based on local types of renewable fuels. | 4 |  |  |  | + |  |  |  |  |  |
| Aerodynamics and heat transfer of bodies in a turbulent flow | The purpose of the discipline is to build mathematical models of varying degrees of complexity and informativeness to describe discrete turbulent flows within the framework of the Eulerian approach taking into account the totality. physico-chemical processes occurring during gorenje and gasification of particles, and the development of software complexes that allow calculations in real-world geo-metry devices. |  |  |  | + |  |  |  |  |  |
| D 14 | Principles of Nanotechnology (in English) | The purpose of studying the discipline "principles of nanotechnology" is to study the basic knowledge and skills that allow you to navigate in terminology and directions, as a set of technological methods used to study nanotechnology, including the design and construction of materials, devices and systems, including control and management of the chemical composition and interaction of their components, individual elements of the nano-range. | 4 |  |  |  |  |  | + |  |  |  |
| Physics of impulsephenomena | The purpose of the course is the formation of a scientific worldview and thinking among future specialists, the development of techniques, methods and techniques for solving specific problems from different sections of physics, familiarization with modern scientific equipment, the formation of initial skills for conducting experimental scientific research, which will help in their professional activities in the future. |  |  |  |  |  | + |  |  |  |
| D 15 | Physical methods of non-destructive testing | Summary of the course: to set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. | 5 |  |  |  |  |  | + |  |  |  |
|  | Methods of measuring the thermal resistance of thin-layer coatings | The objectives of the discipline are to provide graduates with knowledge on measuring instruments, basic metrological concepts, elements of error theory, general concepts of reliability for measurement and control systems of modern power plants. | 5 |  |  |  |  |  | + |  |  |  |
| D 16 | Methods for restoring heat exchangers | Summary of the course: analysis of chemical cleaning of heat exchangers from various types of contamination. Methods for restoring the characteristics of heat exchangers. Electrohydraulic method of cleaning heat exchangers. | 4 |  |  |  |  |  |  | + |  |  |
| Dynamics and heat exchange of bodies in a turbulent flow | The purpose of teaching the discipline is to study the unsteady movements of liquids with gas and steam bubbles. Systematic presentation of mechanics and engineering thermophysics of various multiphase media, including bubble liquids, gas- and vapor-liquid flows of mixtures of mutually insoluble liquids in porous bodies. |  |  |  |  |  |  | + |  |  |
| D 17 | Automated thermal energy distribution systems | The purpose of the discipline is to study the general principles of the functioning of the automated control system of thermal power plants; to teach to make and justify specific technical decisions when choosing the structure of the systems for the regulation of thermal facilities, the structure of the automated control system and the automated control system. | 4 |  |  |  |  |  |  | + |  |  |
| Modeling of non-stationary processes of heat and mass exchange based on MathCAD (in English) | The objectives of the discipline are to study the theoretical foundations of numerical methods, modeling of physical processes, methods for solving systems of differential accessories, symbolic methods for solving systems belonging to MathCAD programs. |  |  |  |  |  |  | + |  |  |
| D 18 | Research practice | Research practices are organized in accordance with the profile of the master's program and include the formation of the required competencies of undergraduates. When checking, there is an individual educational trajectory, the topic of the master's dissertation, as well as the type of professional activity chosen by the magician. The practice includes the implementation of a list of tasks by a master student on the profile of his future activity. It requires the study, collection, processing and systematization of materials for writing magic. | 12 |  |  |  |  |  |  |  | + |  |
| D 19 | Research work of a master's student, including internship and completion of a master's thesis (RWMS) | The main purpose of the research work (RWMS) is the study by undergraduates of the current state of the scientific and practical problem on the topic of the master's thesis. Research work for the preparation of a master's thesis was carried out simultaneously with the educational process during the duration of the master's degree and in the form of a scientific seminar. | 24 |  |  |  |  |  |  |  | + |  |
| D 20 | Preparation and defense of a master's thesis | The purpose of the problem investigated in the work should be in demand and relevant. The ways to solve it and the methods used are innovative and previously unexplored. A master's student should rely on new inventions in her work and have suggestions for solving the problem. | 12 |  |  |  |  |  |  |  |  | + |

**20. Coordination of the planned learning outcomes with the methods of teaching and evaluation within the module**

|  |  |  |  |
| --- | --- | --- | --- |
| **Learning results** | **Planned learning results for the module** | **Teaching methods** | **Assessment methods** |
| LR 1 | Able to use knowledge of traditional and modern problems of the history and philosophy of science in research activities in the professional direction. Has the basic concepts and categories of the philosophy of science for setting and solving urgent problems in his own field of scientific research. Substantiates the modern paradigm of higher education, its content. | Interactive lecture, case-methods, round table, analysis of publications, demonstration of speech | Colloquium, testing |
| LR 2 | Fluent in foreign languages at a level that allows effective interaction in a professional and scientific environment; he has skills that allow him to carry out further training and development of a linguistic personality with a high degree of self-activity and self-regulation. To know foreign terminology in thermal power engineering. Applies knowledge of foreign terminology in thermal power engineering at a professional level when reading foreign literature. | Interactive lecture, experimental works intended for scientific research | Project preparation |
| LR3 | Able to use basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations in cognitive and professional activities. Has basic theoretical knowledge about the organization of innovation activities, basic theoretical knowledge about the use of information technology in innovation risk management. | Interactive lecture, experimental works intended for scientific research | Written work |
| LR4 | Know the main traditional and non-traditional renewable energy sources; the energy potential of renewable energy sources; principles and methods of practical use of renewable energy sources. Provision of technical solutions aimed at the rational use of unconventional and renewable energy sources; | Round table | Portfolio |
| LR5 | Knows the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activity; understands the methods of planning and organizing scientific research; has the methodology of scientific design, creativity, the general scheme of organizing scientific research, the practice of using methods of scientific knowledge in the field of innovation in natural sciences. Scientific, technical and technological research. | Interactive lecture, discussion, analysis of scientific literature, presentation of reports | Written work |
| LR6 | To set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. Know different types of heat exchange and methods of their calculation; be able to calculate different types of heat exchange and the thermal state of various components and parts; | Interactive lecture, discussion, analysis of scientific literature, presentation of reports | Testing |
| LR7 | Know the basic principles of heat and mass transfer and methods of mathematical modeling of heat and mass transfer processes and installations, the main sources of scientific and technical information about new developments in the field of heat and mass transfer; be able to independently analyze the processes of heat and mass transfer and make optimal decisions in the design and operation of heat and mass exchange equipment; | Analysis of conducted experiments, analysis of scientific literature, presentation of reports | Report, presentation |
| LR8 | Know the procedures for setting and solving scientific problems; applies standards and regulations for the registration of research results, for the preparation of scientific reports, publications for seminars and conferences; applies procedures for searching global networks for information on scientific developments, opportunities for scientific contacts, applications for scientific grants of various levels. | Monitoring of the implementation by doctoral students of an individual research plan (publication of scientific results, preparation  of a dissertation). | Report, presentation |
| LR9 | Demonstrates the procedures for testing the results of scientific research, preparation of publications on the results of scientific research; possess a way of presenting scientific materials and forming a manuscript of scientific work, registration of a master's thesis. | Analysis of the results of the intermediate and final certification of the research work of PhD students. Organization and monitoring of the defense of doctoral dissertations. | Protection |

**21. The graduate model of the educational program**

Attributes:

- deep professional knowledge in their field of study;

- interest in mastering trends in education and science;

- ability to collaborate in the professional community;

- independence in the search for opportunities for professional and personal development;

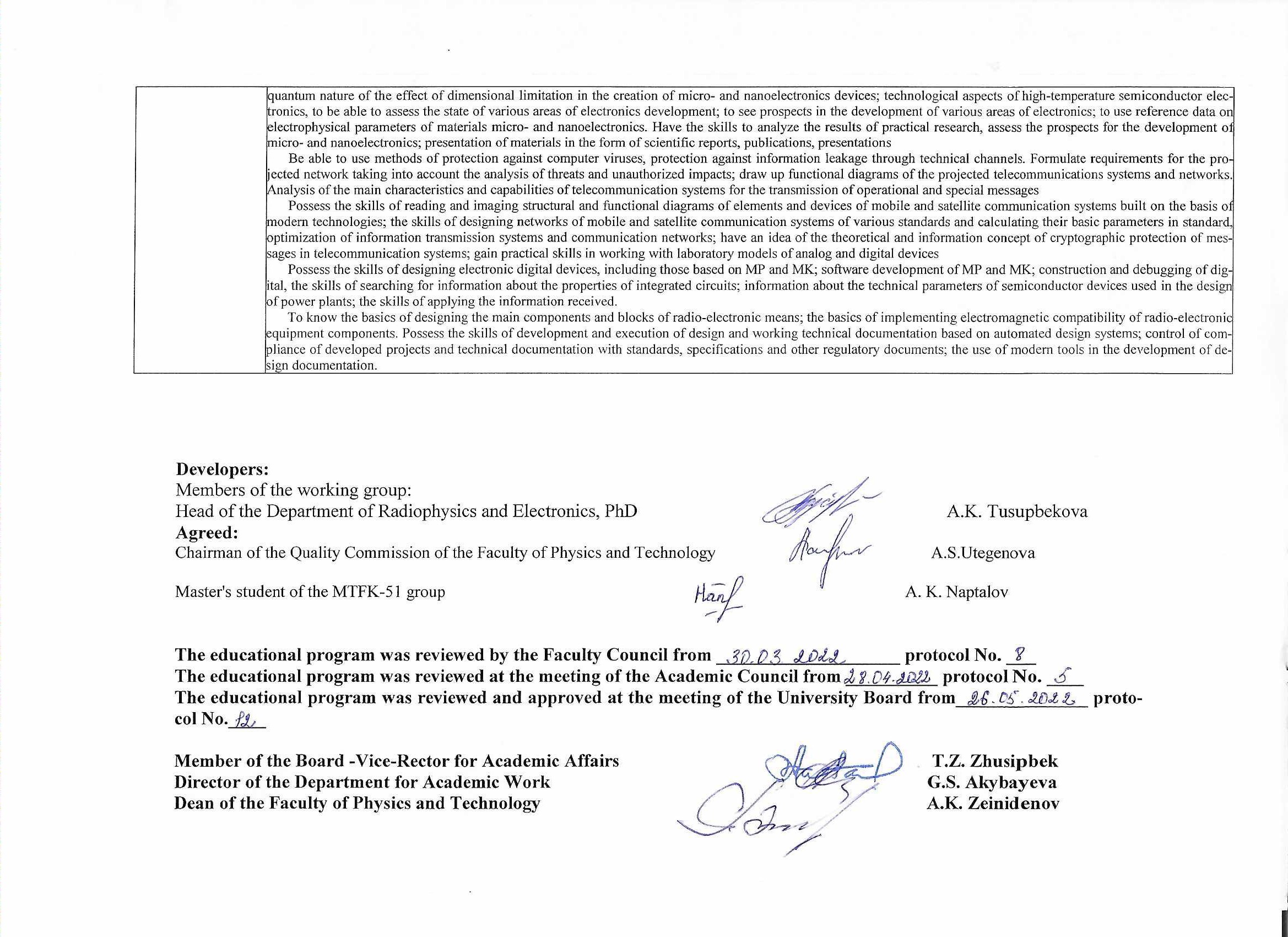
- sociability;

- tolerance and good manners;

- academicintegrity;

- willingness to participate in solving state tasks and strategies of Kazakhstan.

|  |  |
| --- | --- |
| **Types of competencies** | **Description of competencies** |
| 1. Behavioral skills and personal qualities (Soft skills) | Able to use knowledge of traditional and modern problems of the history and philosophy of science in research activities in the professional direction. Has the basic concepts and categories of the philosophy of science for setting and solving urgent problems in his own field of scientific research. Fluent in foreign languages at a level that allows effective interaction in a professional and scientific environment; has the skills to carry out with a high degree of independence and self-regulation further training and development of a linguistic personality. He is able to use basic knowledge in the fields of commercialization of innovations and evaluation of the commercial potential of innovations in cognitive and professional activities. |
| 2. Digital competencies (Digital skills): | Know the main traditional and non-traditional renewable energy sources; the energy potential of renewable energy sources; principles and methods of practical use of renewable energy sources. Providing technical solutions aimed at the rational use of unconventional and renewable energy sources; know the basic theoretical provisions, principles, terms, concepts, processes, methods, technologies, tools, operations of scientific activity; understands the methods of planning and organizing scientific research; possesses the methodology of scientific conception, creativity, the general scheme of the organization of scientific research, the practice of using methods of scientific cognition in the field of innovation in natural science, technical and technological research. To master the methods and techniques of analog, physical and mathematical modeling; development of skills and abilities: mathematical modeling of processes. |
| 3. Professional competencies (Hard skills) | To set and solve innovative tasks for the application of modern methods of non-destructive testing using system analysis and modeling of control processes. Apply in-depth knowledge in the field of non-destructive testing of products and welded joints. To know different types of heat exchange and methods of their calculation; to know the basic principles of heat and mass transfer and methods of mathematical modeling of heat and mass transfer processes and installations, the main sources of scientific and technical information about new developments in the field of heat and mass transfer; independently set and solve problems of thermohydraulic processes and perform numerical calculations; develop computer models of thermohydraulic processes. Know the procedures for setting and solving scientific problems; applies standards and regulations for the design of research results, for the preparation of scientific reports, publications for seminars and conferences; demonstrates procedures for testing the results of scientific research, preparation of publications based on the results of scientific research; possess the method of presentation of scientific materials and the formation of the manuscript of scientific work, the design of a master's thesis. |

****