Mining and Metallurgical Institute named after O.A. Baikonurov

Department of "Materials Science, Nanotechnology and Engineering Physics"

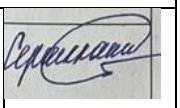
EDUCATIONAL PROGRAM
7M07103 "Engineering physics and Materials Science"

Code and classification of the field of education: **7M07 "Engineering, manufacturing and construction industries"**
Code and classification of training directions: **7M071 "Engineering and Engineering Trades"**
Group of educational programs: **M101 "Materials Science and Technology"**
Level based on NQF: 7
Level based on IQF: **7**
Study period: 2years
Amount of credits: **120**

Almaty 2023

The educational program 7M07109 "Engineering physics and materials science" was approved at a meeting of the Academic Council of KazNTU named after K.I.Satpayev.
Protocol No. 2, «21» 10. 2022
was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council.

Protocol No. 3, «27» 10. 2022.

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
Serikkanov A.S.	Candidate of Physical and Mathematical Sciences	Director of "Physico-Technical Institute" LLP	"Physico-Technical Institute" LLP	
Teaching staff:				
Kudaibergenov K.K.	PhD	Head of Department	Non-profit Joint Stock Company "Kazakh National Research Technical University named after K.I. Satpayev"	
Smagulov D.U.	Doctor of Technical Sciences	Professor	Non-profit Joint Stock Company "Kazakh National Research Technical University named after K.I. Satpayev"	
Employers:				
Ismailov M.B.	Doctor of Technical Sciences	Director of the Department of Jet Propulsion and Materials Science.	National Center for Space Research and Technology JSC	
Murzalinov D.O.	PhD	Head of Laboratory	Physico-Technical Institute LLP	

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List of abbreviations and designations

Abbreviation		Full name
Ts	–	Teaching staff
EP	–	Educational program
OR	–	Registrar's Office
WC	–	Working Curriculum EP

1. Description of educational program

The main objectives of the educational program are:

- to provide scientific training of undergraduates for their successful solution of scientific and engineering problems of an interdisciplinary nature;

- develop the skills of scientific analysis, staging and conducting scientific research, including as a team member;

- develop skills in the possession and application of scientific research methods, technologies for obtaining and processing materials for a specific purpose;

- to develop ideas about professional and ethical responsibility, the ability to independently study and improve their qualifications during their lifetime for a successful career in scientific, scientific and industrial organizations and educational institutions engaged in solving scientific and technical problems.

The program is aimed at the following types of professional activity:

experimental research;

design and analytical;

production and technological;

scientific and pedagogical.

The objects of professional activity of the Master of Technical Sciences are:

employees of national companies, research centers, business structures, public administration of industry and committees on science and technology; teachers in higher educational institutions.

2. Purpose and objectives of educational program

Purpose of EP: The main purpose of the educational program is to provide scientific training for undergraduates to successfully solve scientific and engineering problems of an interdisciplinary nature, to develop the skills of scientific analysis, formulation and conduct of scientific research, to teach the skills of possession and application of scientific research methods, technologies for obtaining and processing materials for a specific purpose.

Tasks of EP:

The objectives of the educational program are consistent with the types of future professional activity and are as follows:

in the field of experimental research activities:

- analysis of the task of research in a given field based on the selection and study of literary and patent sources;
- diagnostics of the state and dynamics of objects of activity (materials, technological processes, equipment in various industries using the necessary tools and methods of analysis);
- study of the structure and properties of technical materials, their improvement and creation of new materials and technological processes for their manufacture;
- construction of mathematical models, computer modeling to solve the problem;
- carrying out measurements and research in the development of new materials and technologies according to a given methodology with the choice of modern technical means and computer processing of the results;
- in the field of design and analytical activities:
- formulation of the objective and objectives of the project (program) with the given criteria, target functions, constraints, building the structure of their relationships, identifying priorities for solving problems;
- development of generalized solutions to problems, analysis of these options, forecasting of consequences, finding compromise solutions in conditions of multi-criteria, uncertainty, planning and implementation of projects;
- development of production equipment projects taking into account mechanical, technological, design, operational, ergonomic, aesthetic and economic parameters;
- the use of information technology to select the necessary materials and equipment in the manufacture of finished products;
- in the field of production and technological activities:
- conducting physical and experimental studies using modern methods of measuring and processing the results obtained;
- introduction of technological processes of production, quality control of elements and assemblies for various purposes;

calculation of production rates, technological standards for material consumption, selection of standard equipment, preliminary assessment of the economic efficiency of the selected materials;

- efficient use of materials and equipment, selection and calculation of

technological process parameters for the preparation of finished products;

 quality control of materials and technologies;

- in the field of scientific and pedagogical activity:

ensuring high-quality transfer of skills and knowledge and the ability to work with staff during their training.

3. Requirements for evaluating the educational program learning outcomes

Learning outcomes include knowledge, skills and competencies and are defined both for the educational program as a whole and for its individual modules, disciplines or tasks.

The main task at this stage is to select assessment methods and tools for all types of control, with the help of which it is possible to most effectively assess the achievement of planned learning outcomes at the discipline level.

The previous level of education of applicants is higher professional education (bachelor's degree). The applicant must have a diploma of the established sample and confirm the level of knowledge of the English language with a certificate or diplomas of the established sample.

The procedure for admission of citizens to the magistracy is established in accordance with the "Standard rules for admission to training in educational organizations implementing educational programs of postgraduate education".

The formation of a contingent of undergraduates is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for training at the expense of citizens' own funds and other sources. The State provides citizens of the Republic of Kazakhstan with the right to receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive education of this level for the first time.

At the "entrance", a master's student must have all the prerequisites necessary to master the relevant master's degree program. The list of necessary prerequisites is determined by the higher educational institution independently.

In the absence of the necessary prerequisites, the undergraduate is allowed to master them on a paid basis.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M07 "Engineering, manufacturing and construction industries"
2	Code and classification of training directions	7M071 "Engineering and engineering trades"
3	Educational program group	7M071 "Material Science and Technology"
4	Educational program name	7M07103 "Engineering Physics and Materials Science".
5	Short description of educational program	The main objectives of the educational program are to provide scientific training of undergraduates for their successful solution of scientific and engineering problems of an interdisciplinary nature
6	Purpose of EP	The purpose of the educational program is to provide fundamental and practical training for students to solve scientific and engineering problems in various fields of technical physics and materials science, as well as to develop students' skills in engineering analysis and design.
7	Type of EP	New
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	Two - degree EP
11	List of competencies of educational program	KK1. Communicativeness KK2. Basic literacy in Natural science disciplines KK3. General engineering competences KK4.Professional competencies KK5. Engineering-computer competencies KK6.Engineering-working competencies KK7. Socio-economic competences KK8. Special-professional competences
12	Learning outcomes of educational program	LO1 to substantiate the choice of experimental methods for studying systems with micro- and nano-sizes;

		LO2 plan the organization and conduct of an experiment to obtain materials with special physical and chemical properties (porous nanostructures, magnetic nanomaterials, nanobiomaterials); LO 3 Integrate knowledge in professional activities and have the competence to argue their ideas when making decisions in the field of engineering and technology; LO 4 explain the specifics of the functional purpose of equipment in the field of materials science and the possibility of its digitalization; LO 5 apply physical and chemical methods for obtaining nano-objects and their composites for solving applied problems, as well as methods for describing structures, structures, composition, morphologies; LO 6 to study the current trends in advanced materials science for further scientific and pedagogical activities; LO 7 choose the best methods for solving the problems of materials science, nanoproduction, processing and modification of materials; LO 8 to model and evaluate the forecast of product quality by the parameters of the technological process in order to optimize it in accordance with the type of product obtained;; LO 9 investigate the structure of the material by conducting a physical experiment using laboratory equipment and modern scientific equipment;
13	Education form	Full - time
14	Period of training	2
15	Amount of credits	120
16	Languages of instruction	Kazakh, Russian
17	Academic degree awarded	Master of Technical Sciences
18	Developer(s) and authors	Serikkanov A.S. Kudaibergenov K.K. Smagulov D.U. Ismailov M. B. Murzalinov D.O.

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)								
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CYCLE OF BASIC DISCIPLINES University component												
1	Foreign language (professional)	The course is designed for undergraduates of technical specialties to improve and develop foreign language communication skills in the professional and academic field. The course introduces students to the general principles of professional and academic intercultural oral and written communication using modern pedagogical technologies (round table, debates, discussions, analysis of professionally-oriented cases, design).	5			v		v				
2	History and philosophy of science	Subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and an engineer.	5			v						
3	Materials science and technologies of modern and promising materials	. Mastering the course provides for the development of skills for evaluating the results of scientific and technical developments and research on a set of features, substantiating the choice of the optimal solution, systematization and generalization of achievements in the	5			v						

		field of materials science, materials technology and related fields. The student acquires experience in conducting scientific research on the study of physical, chemical, mechanical, technological and operational properties of metallic, non-metallic and composite nanomaterials for various purposes.									
4	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity. Monitoring of the environment and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5	**v**							
Cycle of general education disciplines University component											
5	Introduction to nanomaterials	To form the ability to describe and evaluate the principles and physico-chemical effects underlying nanotechnology. The training course forms the theoretical basis for understanding the fundamental laws of nanotechnology and quantum-dimensional effects implemented in nanoobjects and nanomaterials. The content of the discipline is aimed at describing the properties of nanoparticles, nanostructures and nanomaterials. Zero-dimensional one- and two-dimensional nanostructured materials are considered. The issues of synthesis of nanomaterials, methods of research of nanostructures and nanomaterials, the most important areas of application of nanomaterials are highlighted.	5		**v**						
6	Defects in the Crystal Structure of Materials	The discipline considers the laws of crystallography, qualitative and quantitative description of structures, establishes the relationship between structure and material properties. The course deals with the theory of defects, the structure of real materials, the essence of such processes as aging, hardening, diffusion.	5			**v**					
7	Alloy steels and alloys. Cast iron.	The purpose of the discipline is the study of steel, cast iron and alloys for its intended purpose. The course covers:	5			**v**					

		steels for springs and springs, for ball bearings, hardened steels, martensitic - aging steels, as well as alloys based on non-ferrous metals intended for especially critical parts and mechanisms, classification of cast irons: white, gray, high-strength, malleable.									
8	Mathematics I	The course is devoted to the study of the basic concepts of higher mathematics and its applications. The main provisions of the discipline are applied in the teaching of all general education engineering and special disciplines taught by graduate departments. The course sections include elements of linear algebra and analytical geometry, an introduction to analysis, differential calculation of functions of one and several variables. Methods for solving systems of equations, problems of using vector calculations in solving problems of geometry, mechanics, and physics are considered. Analytical geometry on a plane and space, differential calculation of functions of one variable, derivatives and differentials, study of the behavior of functions, derivative and gradient in direction, extremum of a function of several variables.	5				v				
9	Mathematics II	The discipline is a continuation of Mathematics I. sections of the course include integral calculus of a function of one variable and several variables, series theory. Indefinite integrals, their properties and methods of their calculation. Certain integrals and their application. Incorrect integrals. Numerical series theory, functional series theory, Taylor and Macloren Series, application of series to approximate calculations.	5			v					
10	Metallography	The discipline studies the features of the alloying process, as well as the dependence of the operational and technological properties of alloys on their structure and phase composition. The course also discusses methods for analyzing the properties of materials, practical skills of metallographic research.	5							v	
11	Mechanical properties of materials	The discipline studies the mechanical properties of materials determined during cyclic, static and dynamic tests, methods for determining hardness, as well as types of deformation	6					v			

		and destruction. The course examines the influence of thermal, thermochemical, thermomechanical treatments on the mechanical properties of materials and the main factors on which they depend.									
12	Fundamentals of materials science	The discipline studies the fundamentals of materials science, as well as various types of materials used in industry, information about their composition, structure, structure, basic physical properties, classification, marking of alloys and methods of influencing properties. The course also examines the basics of phase and structural changes in materials, the general patterns of structure formation during solidification, deformation and various types of material processing.	4				v				
13	Fundamentals of electricity and magnetism	The discipline studies the electric field in matter, the circulation theorem, the magnetic field in matter, electromagnetic induction, forces in a magnetic field, free oscillations, the method of complex amplitudes, Maxwell's equations, electromagnetic waves in waveguides. The course deals with theoretical reviews and methods for solving key problems that are important for understanding the principles of practical application of theoretical knowledge.	5						v		
14	Carbon materials	The purpose of the discipline is to form the ability to organize and evaluate the synthesis of carbon materials. The discipline is aimed at developing students' skills in creating carbon materials by various methods, such as sputtering, deposition and sol-gel, etc. The course covers: the synthesis and structure of carbon nanostructures and the main stages that determine the process of creating carbon materials; methods for obtaining carbon nanomaterials; optimization of technological parameters and characteristics of carbon materials from the main technological parameters; methods for the production of nanocarbon materials.	5					v			
15	Physics	The course studies the basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics as a science on the development of technology; the relationship of physics with	5						v		

		other sciences and its role in solving scientific and technical problems of the specialty. The course covers the following sections: mechanics, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, electrostatics, direct current, electromagnetism, geometric optics, wave properties of light, laws of thermal radiation, photoelectric effect.									
16	Crystal physics	The discipline studies the nomenclature and classification of point and space symmetry groups of crystals, Bravais lattices and syngonies, the basics of the symmetry analysis of tensors, new materials, such as crystals and fullerenes. The course discusses the basic concepts of crystal chemistry, the main types of defects in crystals and their influence on physical properties.	4				v				
17	Physics of metals. Physical properties of materials	The discipline studies the creation of new materials with better or fundamentally new physical, chemical and mechanical properties, as well as structural sensitivity of properties such as fracture resistance, ductility, toughness, hardness, electrical resistance, ferromagnetic properties and their dependence on crystal defects and texture. The course deals with some structurally insensitive properties such as density, elastic modulus, thermal expansion, melting point, thermal conductivity, specific heat, thermoelectric properties, paramagnetic and dynamite properties, reflectivity, radiation absorption.	5						v		
18	Physical chemistry	The course physical chemistry allows students to form the ability to understand the physico-chemical essence of processes and use the basic laws of physical chemistry in complex production and technological activities. In the course of training, the student studies the laws of thermodynamics; basic equations of chemical thermodynamics; methods of thermodynamic description of chemical and phase equilibria in multicomponent systems; properties of solutions; fundamentals of electrochemistry; basic concepts, theories and laws of chemical kinetics and catalysis.	5				v				
19	lloy steels and alloys. Cast iron.	The purpose of the discipline is the study of steel, cast iron	5					v			v

		and alloys for its intended purpose. The course covers: steels for springs and springs, for ball bearings, hardened steels, martensitic - aging steels, as well as alloys based on non-ferrous metals intended for especially critical parts and mechanisms, classification of cast irons: white, gray, high-strength, malleable.									
Cycle of basic disciplines Elective component											
20	Graphene and materials based on it.	The discipline studies the technology of obtaining fundamental knowledge in the field of low-dimensional systems, the use of low-dimensional systems in the creation of new devices and nanotechnology materials, as well as the quantum-dimensional properties of nanocrystals, the energy of the surface of nanocrystals, free dangling bonds of atoms of a nanocrystal, the interfaces of a nanocrystal matrix, the mechanisms of low-temperature growth of nanocrystals and the production of graphene large area.	5						**v**		
21	Dielectric materials	The discipline studies the composition, physico-chemical properties of dielectric materials, with modern methods of obtaining and processing technologies of dielectric materials, the use of dielectric materials for various fields of engineering and technology.	6				**v**				
22	Computer Modeling in Materials Science (thermocalc)	The discipline studies the work on the ThermoCalc software, modeling of multiphase systems using this program. The course examines various systems of alloys based on ferrous and non-ferrous metals in the ThermoCalc database.	5								
23	Structural materials	The purpose of the discipline is to acquire knowledge about the technological processes of manufacturing blanks and parts from metallic and non-metallic materials. Considered: Classification of structural materials. Properties of structural materials. The relationship of the composition, structure and properties of structural materials. Non-metallic structural materials. Methods of surface treatment. Metal-based composites. Ceramic-based composites. Polymer-based	5			**v**					

		composites.									
24	Corrosion and protection of metal structures.	The discipline considers the improvement of methods for protecting metals from corrosion in all industries. The course examines various methods of protecting metal from corrosion, methods of surface treatment with polymers, bituminous coatings, nanomaterials to create surfaces with desired properties.	5					v			
25	Paints and varnishes materials	The purpose of the discipline is to form the ability to organize and evaluate the synthesis of paints and varnishes. The discipline is aimed at developing students' skills in applying paint and varnish in various branches of engineering and technology, as in the use of automotive operating materials, etc. The following are considered: the main stages that determine the process of applying paints and varnishes materials; according to the main properties, quality indicators and organization of rational use operational materials; methods of synthesis and research of paints and varnishes materials; optimization of technological parameters and characteristics of paints and varnishes materials from the main technological parameters; methods of production of paints and varnishes.	5							v	
26	Methods of obtaning and research of nanostructered materials	The discipline studies the basic concepts and definitions of nanosystems and nanotechnologies, the features of physical interactions at the nanoscale, methods for studying and diagnosing nanoobjects and nanosystems, the structure of the main classes of nanomaterials, and their properties.	5		v						
27	Methods of forming the surface nanostructures	The discipline studies the basic concepts, laws and methods of the main physical and chemical processes that underlie the various methods of nanotechnology and the features of thermodynamic and kinetic calculations of physical and chemical processes and the ability to use them in nanotechnology and nanotechnology.	5								
28	Microstructure of Organic Materials	The discipline studies the microstructure and properties of soft materials, including the molecular weight distribution of polymers, amorphous polymers, semi-crystalline polymers, copolymers, elastomers, biopolymers, soft tissues, bones, and cellular structure. The design and	5								v

		functions of implantable biomaterials are considered.									
29	Perspective glasses and glass materials	The purpose of the discipline is to form the ability to organize the synthesis of glass and glass materials and evaluate the physicochemical processes of phase formation, the relationship between the structure and properties of silicate materials, technological features of production, patterns of changes in the properties of products in service. The discipline is aimed at developing doctoral students' skills in creating silicate materials by various methods, such as the method of molding ceramics, binders, glass materials and composites based on them, etc. Planning and organizing technological processes for the production of silicate materials, taking into account the quality of the feedstock and the requirements for the final product The following are considered: the main stages that determine the process of creating glass and glass materials; methods for the synthesis of glass and glass materials; optimization of technological parameters and characteristics of glass and glass materials from the main technological parameters; principles for selecting raw materials and technological solutions for obtaining products based on refractory non-metallic and silicate materials, taking into account the influence of climatic and natural conditions	5					**v**			
30	Polymeric materials and composites based on them	The discipline studies polymers, polymer blends and their miscibility, dynamic, mechanical behavior, the Boltzmann superposition principle, the final properties of polymers, polymer rheology and processing, recycling, and the design and selection of polymer materials.	5							**v**	
31	Reactor Materials Science	The discipline studies the phenomenon of radiation and the effect on the materials of structures for reactors used in nuclear technology.The course examines the patterns of changes in structure, size, structural and phase qualities near exposure to radiation and ways to increase the stability of the qualities of the material.	6				**v**				
32	Structural materials	The purpose of the discipline is to acquire knowledge about the technological processes of manufacturing blanks and parts from metallic and non-metallic materials. Considered:	5					**v**			

		Classification of structural materials. Properties of structural materials. The relationship of the composition, structure and properties of structural materials. Non-metallic structural materials. Methods of surface treatment. Metal-based composites. Ceramic-based composites. Polymer-based composites.									
33	Physics of Low-Dimensional Systems	The discipline studies the physics of low-dimensional systems, structures with quantum wells, quantum wires, quantum dots and superlattices. The course examines the study of electronic, photonic and phonon states in semiconductor nanostructures and the analysis of their physical properties.	6								v
34	Physics of Strength and Plasticity	The discipline studies the mechanical properties of materials, the analysis of the processes of deformation and destruction at different temperatures and conditions of a certain load. The course examines the methods of mechanical testing, factors affecting the structure and composition of materials, methods of mechanical testing, their features, methods of processing the results.	5					v			
Cycle of profile disciplines Component of choice											
35	Methods for studying the structure of material properties	The discipline studies materials for a number of branches of new technology with high physics-mechanical properties, requires a detailed study of their phase composition, structure and properties, using a variety of spectroscopic methods of physical materials science: measurement of quantitative metallography, X-ray diffraction analysis, electron microscopy, differential thermal analyzes , measurement of thermal and mechanical properties of materials, corrosion resistance and wear resistance.	5								v
36	Nanomaterials and nanotechnologies in construction	The purpose of the discipline is to form the ability to organize and evaluate the methodology of the technical and economic assessment of the introduction of nanotechnology in construction . The discipline is aimed at developing the phenomenology of nanotechnology among students production of building materials skills of creating composite materials by various methods, as a method of researching	4						v		

		processes nanostructuring in fine-grained concretes with the addition of nanoparticles of dioxide silicon, etc. The course covers: the main stages that determine the process of identification and the role of nanofillers in composition of fine-grained concretes; methods for the synthesis of various types of nanomaterials; optimization of technological parameters and characteristics of nanomaterials from the main technological parameters; methods for the production of various types of nanomaterials.								
37	Non Metallic Materials and Technologies	The discipline studies the regularities connecting chemical compositions, structures (structure) and properties of materials; patterns of change in the properties of materials in the process of manufacture and operation of products; methods of purposeful change of mechanical and decorative properties of materials; chemical composition and structure, properties and areas of application of the main types of non-metallic materials used for the production of industrial products.	6							v	
38	Semiconductor materials	The discipline studies the physical properties of semiconductor materials, the main physical problems of optoelectronic devices, the fundamentals of the technology for obtaining semiconductor materials and methods for determining their parameters, the principle of operation of devices based on semiconductor materials.	4							v	
39	Functional materials	The discipline studies the production of new materials with a controlled structure and properties, the change in the technical parameters of properties from external factors, as well as the influence of the chemical composition and various types of processing that affect the course of structural and phase transformations in the material. The course examines the physicochemical properties of various modern functional materials and their practical application.	5								v
40	Chemical-thermal treatment of metals and alloys.	The discipline studies the theoretical foundations of the chemical-thermal treatment of materials and the technology of their surface hardening. The course discusses the optimal, economical modes of chemical-thermal treatment of metals for the synthesis of the required structure and properties of	5								

		materials and choose the most effective methods of chemical-thermal treatment, as well as promising types of chemical-thermal treatment of materials to increase the strength, durability, reliability of products.									
41	Modern surface hardening technologies	Within the course, students study the relationship of physical, chemical and mechanical properties of materials with their operational characteristics, methods and equipment for coating in order to form the specified properties. Also, students solve problems of strengthening the surface of materials and increasing the service life of machine parts and mechanisms by applying reinforcing and protective coatings.	4						v		
42	Technologies for the production of powder composite materials	The course provides knowledge of the classification and labeling of powder composite materials and applications, develops the ability to determine the granulometric composition in various ways, particle shape, microhardness, bulk density, fluidity, compressibility and experience in obtaining powders and products from them, depending on the purpose and required characteristics, as well as based on economic considerations.	6							v	
43	Functional problems of materials science	The content of the course includes the formation of undergraduates in-depth theoretical knowledge in the field of materials science, ideas about current topical problems and methods of solving them, as well as the ability to independently set tasks for solving functional problems and ways to solve them by studying the characteristics, properties and structure of materials.	6								v

5. Curriculum of educational program

МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РЕСПУБЛИКИ КАЗАХСТАН
КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ имени К.И.САТПАЕВА

SATBAYEV UNIVERSITY

УТВЕРЖДАЮ
Председатель правления -
Ректор КазНИТУ им.К.Сатпаева
_____ М.К.Ватентаев
«__» _____ 2022 г.

УЧЕБНЫЙ ПЛАН
ОБРАЗОВАТЕЛЬНОЙ ПРОГРАММЫ для набора на 2022-2023 уч. год

Образовательная программа 7М07103 - "Материаловедение и технология новых материалов"
Группа образовательных программ М101 - "Материаловедение и технология новых материалов"

Форма обучения: очная **Срок обучения: 2 года** **Академическая степень: магистр технических наук**

Код дисциплины	Наименование дисциплин	Цикл	Общий объём в кредитах	Всего часов	Аудиторный объём лек/лаб/пр	СРО (в том числе СРОП) в часах	Форма контроля	Распределение аудиторных занятий по курсам и семестрам			
								I курс		2 курс	
								1 семестр	2 семестр	3 семестр	4 семестр
М-1. Модуль базовой подготовки (вузовский компонент)											
LNG210	Английский язык (профессиональный)	БД ВК	5	150	0/0/3	105	Э	5			
HUM214	Психология управления	БД ВК	3	90	1/0/1	60	Э	3			
HUM212	История и философия науки	БД ВК	3	90	1/0/1	60	Э		3		
HUM213	Педагогика высшей школы	БД ВК	3	90	1/0/1	60	Э		3		
М - 2. Модуль прикладных задач материаловедение											
PHY712	Технологическое обеспечение качества материалов	БД КВ	5	150	2/0/1	105	Э		5		
PHY278	Современные проблемы наук о материалах и процессах				1/0/2						
PHY711	Материаловедение и технологии перспективных материалов	БД КВ	5	150	2/0/1	105	Э		5		
PHY280	Научные основы и практика нанесения нанопокрытий				1/0/2						
PHY715	Физико-химические методы исследования материалов	БД КВ	5	150	2/0/1	105	Э	5			
MNG704	Проектный менеджемнт				2/0/1						
PHY719	Многофазные структуры и методы расчета фазовых диаграмм	ПД ВК	5	150	2/0/1	105	Э			5	
PHY720	Разрушение и оценка надежности материалов	ПД КВ	5	150	2/0/1	105	Э			5	
PHY274	Методы расчета фазовых превращений и структурного анализа материалов				2/1/0,						
М-3. Модуль передового материаловедение											
PHY713	Компьютерное моделирование в материаловедении	ПД ВК	5	150	2/0/1	105	Э		5		
PHY714	Новые функциональные материалы	ПД ВК	5	150	2/0/1	105	Э		5		
PHY716	Материалы для 3D технологии	ПД ВК	5	150	2/0/1	105	Э	5			
М-4. Модуль нанотехнологии											
PHY717	Функциональные проблемы материаловедения	ПД КВ	5	150	2/0/1	105	Э	5			
PHY260	Методы получения функциональных материалов и наноструктур				1/0/2						
PHY722	Прогрессивные технологии обработки материалов	ПД КВ	5	150	2/0/1	105	Э			5	
PHY261	Исследование функциональных материалов методами электронной и зондовой микроскопии				1/0/2						
PHY721	Инженерия поверхностных структур	ПД КВ	5	150	2/0/1	105	Э			5	
PHY275	Наноматериалы и нанотехнологии в металлургии				2/1/0,						
М-5. Модуль "R&D"											
PHY718	Методология выбора материалов и технологии	ПД КВ	5	150	2/0/1	105	Э			5	
PHY276	Инновации в материаловедении				2/0/1						
М-6. Практико-ориентированный модуль											
AAP229	Педагогическая практика	БД ВК	6						6		
AAP256	Исследовательская практика	ПД ВК	4								4

М-7. Научно-исследовательский модуль												
AAP251	Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации	НИРМ ВК	2					2			
AAP241	Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации	НИРМ ВК	3						3		
AAP254	Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации	НИРМ ВК	5							5	
AAP255	Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации	НИРМ ВК	14								14
М-8. Модуль итоговой аттестации												
ECA205	Оформление и защита магистерской диссертации	ИА	12								12
	Итого по УНИВЕРСИТЕТУ:							30	30	30	30
								60		**60**	

Количество кредитов за весь период обучения					
Код цикла	**Циклы дисциплин**	**Кредиты**			
			вузовский компонент (ВК)	**компонент по выбору (КВ)**	**Всего**
БД	Цикл базовых дисциплин		20	15	35
ПД	Цикл профилирующих дисциплин		24	25	49
	Всего по теоретическому обучению:	*0*	*44*	*40*	*84*
	НИРМ				*24*
ИА	Итоговая аттестация	12			12
	ИТОГО:	**12**	**44**	**40**	**120**

Решение Учёного совета КазНИТУ им. К.Сатпаева. Протокол № __от "____" _____20___ г.

Решение Учебно-методического совета КазНИТУ им. К.Сатпаева. Протокол № __от "____" _____20___ г.

Решение Ученого совета института _____. Протокол № __от "____" _____20___ г.

Проректор по академическим вопросам _____ **Жаутиков Б.А.**

Директор института ГМИ _____ **Рысбеков К.Б.**

Заведующий кафедрой МНиИФ _____ **Какимов У.К.**

Представитель Совета от работодателей _____ **Серикканов А.С.**