

**NON-PROFIT JOINT STOCK COMPANY
RUDNENSKY INDUSTRIAL INSTITUTE**

«APPROVED»

**by the decision of the meeting of the Academic Council of the
Institute
protocol № dated _____ 2022**

Chairman of the Academic Council _____ A. Naizabekov

MODULAR EDUCATIONAL PROGRAM

7M07303 «Construction»

(code and name of the educational program)

Educational program level: Master's degree

Period of education – 2 years

Scientific and pedagogical direction

Developers:

Head of the educational program

Miryuk O. _____

Members of the working team on the development of the educational program

Oleynik A. _____

Representative of employers

Yakupov F. _____

1. Passport of the educational program

The graduate of the scientific and pedagogical master's degree in the field of training "7M073 - Architecture and Construction" is awarded the academic degree "Master of Technical Sciences".

The educational program of the scientific and pedagogical magistracy contains:

- 1) theoretical education, including the studying of cycles of basic and core disciplines;
- 2) practical training in the form of pedagogical and research practice;
- 3) research work of a master's student, including internship and completion of a master's thesis;
- 4) final certification.

The educational program "Construction" is implemented along two learning paths: 1 – "Modern technologies in the design of construction objects"; 2 – "Technology of construction of objects of increased reliability".

The purpose of the educational program is to train competent highly qualified specialists in relevant areas of construction, who possess research methods, teaching and learning skills, modern computer design and progressive organization of energy-efficient construction technologies using durable materials, with professional and personal competencies sufficient for successful activity at enterprises of domestic and international labor markets.

Requirements for the *key competencies* of graduates of the scientific and pedagogical Master's degree: the graduate of the educational program must:

- *have an idea*: about the latest achievements and discoveries in the field of construction and the prospects for their use; about the directions of higher school pedagogy, research activities; about modeling systems in the design and technology of construction production;

- *know*: state, Russian and foreign languages that provide communication in professional activities; methods of solving problems in the design and construction of buildings and structures, international and domestic standards; the main factors influencing the structure of the economy in the architectural and construction sector; rules and conditions for construction and installation work, fundamentals of pedagogy and psychology, methods of conducting scientific research, achievements of science and technology, quality management standards, advanced achievements of science and technology;

- *be able to*: formulate and solve problems in the process of practical, research and teaching activities, choose research methods and develop new ones; use BIM technologies in construction design, the latest achievements in the field of building materials science; calculate structures for stability; creatively approach problem solving and make effective decisions;

- *have the skills*: to plan and organize practical, pedagogical, research and management activities; to use information and computer technologies and scientific methods in conducting research;

- *to be competent*: in matters of scientific methodology, the use of modern software products, processing of the results and forms of their presentation.

The scope of professional activity of the Master of Technical Sciences is related to the design and construction of buildings and structures; engineering surveys for construction; conducting scientific research and educational activities.

Types of activities of Masters of Technical Sciences:

- settlement and design and technical and economic;
- organizational and managerial;
- production, technological and operational;
- expert and consulting;
- research;
- educational (pedagogical).

The objects of professional activity of the Master of Technical Sciences are: organizations of higher and secondary vocational education; research and design institutions; companies, firms and organizations (enterprises) of the construction complex; organizations (enterprises) of other economic infrastructures.

The graduate of the educational program must have *general cultural competencies*:

- the ability to abstract thinking, analysis, synthesis;
- willingness to act in non-standard situations, to bear social and ethical responsibility for the decisions taken;
- readiness for self-development, self-realization, use of creative potential.

As a result of mastering the educational program, the graduate must have *general professional competencies*:

- readiness to communicate in the state, Russian and foreign languages to solve the tasks of professional activity;
- willingness to lead a team in the field of professional activity, tolerantly perceiving social, ethnic, confessional and cultural differences; the ability to use in practice skills and abilities in the organization of scientific and production work, team management, to assess the quality of performance results;
- the ability and willingness to navigate in the formulation of the task, apply knowledge about modern research methods, analyze, synthesize and critically summarize information;
- the ability to demonstrate knowledge of fundamental and applied disciplines of the master's degree program;
- the ability to independently acquire new knowledge and skills with the help of information technology and use them in practice; expand and deepen their scientific worldview;
- the ability to use skills and abilities in practice in the organization of research and scientific-production work, in team management, to influence the formation of team goals, to influence the socio-psychological climate to achieve goals, to assess the quality of activities;
- the ability to demonstrate skills in a scientific team, the ability to generate new ideas;
- the ability to understand the main problems of their subject area, in solving which there is a need for complex selection tasks requiring the use of quantitative and qualitative methods;
- the ability and willingness to conduct scientific experiments using modern research equipment and instruments, to evaluate the results of research;
- the ability to design, present and report the results of the work performed.

As a result of mastering the educational program, the graduate must have *professional competencies*:

- knowledge and skills of using methods of design and construction of buildings and structures, calculation of structural elements using specialized software products;
- willingness to assess the quality and durability of building materials, possess the skills to study the properties of materials for effective construction;
- the ability to develop draft, technical and operational projects of complex objects, including using computer-aided design systems.
- the ability to develop methods, plans and programs for research and development, prepare tasks for performers, organize experiments and tests, analyze and summarize the results;
- ability to collect, analyze and systematize information on the research topic, prepare scientific and technical reports, reviews of publications on the research topic;
- the ability to develop physical and mathematical (computer) models of phenomena and objects related to the profile of activity;
- possession of methods for protecting intellectual property objects, managing the results of research activities and commercialization of intellectual property rights;
- the ability, based on knowledge of pedagogical techniques, to take direct part in the educational activities of structural units of an educational organization in the profile areas of training.

2. The content of the educational program

[illegible]

1	2	3	4	5	6	7	8	9	10	11
MIR. Research and calculation methods	Knowledge of techniques and methods of mathematical modeling; skills in developing mathematical models of deformation of building structures; ability to apply mathematical modeling to solve scientific and technical, fundamental and applied problems. Knowledge about the methodology and methods of conducting research in construction. Conducting theoretical research using information technology; planning and staging an experiment using instruments and equipment.	8	1	RSKIK K 1106 / MMM S 1106	Calculations of building structures using computer systems / Methods of mathematical modeling in construction	BD	CC	5	E	general cultural, general professional
			1	MNIS SM 1201	Methodology of scientific research in the field of construction and building materials science	PD	IC	3	E	

1	2	3	4	5	6	7	8	9	10	11
SMP. Modern design methods	Skills of BIM-design of construction production at the stage of full project support from the development of technical documentation to the construction of a building within the framework of the Industry 4.0 concept. Knowledge of design methods and methods of foundation construction taking into account soil mechanics. Knowledge and skills of using architectural and construction computer design systems based on BIM modeling to create objects with a given reliability. Knowledge of information and communication technologies in business management. Skills of feasibility study and analysis of the effectiveness of design solutions, knowledge of methods of automated calculation of costs for production and sale of products.	20	2	BIMT SP 1202	BIM technologies in construction design	PD	IC	5	E	general professional, professional
			2	PFUO 1203 / FON NS 1203	Design of foundations on compacted bases / Foundations on bases with low load-bearing capacity	PD	CC	5	E	
			3	BIMPEO 2202 / ASOP N 2202	BIM-design of energy-efficient facilities / Architecture of high-reliability construction facilities	PD	CC	5	E	
			3	PM 2108 / EST 2108	Project Management / Economics of Construction Technologies	BD	CC	5	E	

1	2	3	4	5	6	7	8	9	10	11
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SST. Modern construction technologies	Knowledge of technology and properties of composite building materials. Skills of reasonable assignment of composite materials in the technology of construction industries. Mastering the basic provisions of the theory and practice of the construction of monolithic and prefabricated monolithic buildings, possession of modern methods of technological design of works during the construction of objects taking into account geotechnical characteristics. Mastering the methods of modern computer-aided design of organizational and technological preparation and control of construction processes.	14	2	TPKM S 1204	Technology and application of composite materials for efficient construction	P D	I C	5	E	professional
			2	VSO URU 1205 / STM D 1205	Construction of construction projects taking into account regional conditions / Modern technologies of monolithic housing construction	P D	C C	5	E	
			2	ASPI KK 1206 / ATS P 1206	Automation of construction processes using computer control / Automated technologies of construction production	P D	C C	4	E	

1	2	3	4	5	6	7	8	9	10	11
NIRM. Research work of a master's student	Relevance, scientific novelty and practical significance of the work. The use of modern methods of scientific research, theoretical, methodological and technological achievements, advanced international experience. The content of research (methodological, practical) sections.	24	2	NIRM 1301	Research work of a master's student, including internship and completion of a master's thesis	RWo MS		3		general cultural, general professional, professional
			3					3		
			4					18		

1	2	3	4	5	6	7	8	9	10	11
Pra. Practicum	Consolidation of theoretical knowledge gained in the learning process, formation of practical skills of teaching and learning methods. Knowledge of the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.	20	2	PP 1107	Pedagogical practice	BD	IC	3	D C	general cultural, general professional, professional
			3	IP 2208	Research practice	PD	IC	17	D C	
OZMD. Preparation and defense of a master's thesis	Knowledge of key competencies.	12	2	IA (OZMD) 2401	Final certification (preparation and defense of a master's thesis)	FC (PaDo MT)		12		general cultural, general professional, professional

1	2	3	4	5	6	7	8	9	10	11
IS. Innovations in construction	Knowledge and ability to use the technical and software capabilities of modern geoinformation systems. Knowledge of models, structure and sources of spatial data. Thematic visualization, spatial analysis in geoinformation systems. Skills of modeling various options in accordance with building regulations. Calculation of economic, environmental, natural risks and threats using systems. Knowledge and ability to use the capabilities of additive technologies. Knowledge of automation methods and resource-saving methods when using the 3D printing method for the construction of objects. Skills of substantiating the choice of materials for additive construction technologies, technological complexes for 3D construction.	5	2	GSS 1501/ AS 1501	Geoinformation systems in construction / Additive construction	ATT	C	3	E	general professional, professional
			3			ATT	C	2	E	

3. Summary table on the scope of the educational program

Course of study	Semester	Number of modules to be mastered	Number of subjects studied		Number of ECTS credits						Total in hours	Quantity and form of control	
			IC	CC	theoretical training	research work of a master's student	pedagogical practice / research practice	additional types of training	final certification	total		exam	differentiated credit
1	1	2	5	2	30	—	—	—	—	30	900	7	—
	2	5	3	4	24	3	3/—	3	—	33	990	6	1
2	3	+4	1	2	10	3	—/17	2	—	32	960	3	1
	4	1+1	—	—	—	18	—	—	12	30	900	—	—
Total		8	9	8	64	24	3/17	5	12	125	3750	16	2

4. Learning outcomes of the educational program

Graduates of the educational program have the following abilities:

- 1) demonstrate developing knowledge and understanding in the field of construction, based on advanced knowledge of building materials science, methods of calculation of structures, construction production technology for the original development or application of ideas, in the design of objects, in scientific research, pedagogical work;
- 2) apply their knowledge, understanding and abilities at a professional level to solve scientific problems in construction and building materials science in a broad interdisciplinary context;
- 3) collect and interpret information in the field of scientific and technical problems and prospects for the development of construction, integrate knowledge, make judgments taking into account ethical and social responsibility for the application of these judgments and knowledge
- 4) clearly and unambiguously communicate information, ideas, conclusions, problems and solutions in the field of development, development and implementation of energy-efficient construction technologies and durable building materials to both specialists and non-specialists;
- 5) training skills necessary for independent continuation of further training in the field of modern construction and building materials science.