

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF
THE RUSSIAN FEDERATION**

FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION OF HIGHER
EDUCATION
"NOVOSIBIRSK STATE TECHNICAL UNIVERSITY"

**GENERAL CHARACTERISTICS OF
THE MAJOR PROFESSIONAL ACADEMIC PROGRAM
OF HIGHER EDUCATION**

Training area: 13.04.02 Electric Power and Electrical Engineering

Specialization: Improving the Energy Efficiency of Electric Transport Systems

Qualification: Master

Full-time form of education

Beginning year of the training program: 2019

The academic program was approved by the Academic Council of the Faculty of Mechatronics and Automation, protocol No. 5 dated 08/31/2020.

“APPROVED”

First Vice-Rector

_____ V.V. Yanpolsky

August 31, 2020

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1. GENERAL PROVISIONS

1.1 Regulatory documents

The major professional academic master program (a master program) for 13.04.02 Electric Power and Electrical Engineering training area and with specialization on: Improving the Energy Efficiency of Electric Transport Systems is developed in accordance with the following documents:

- The Federal State Educational Standard of Higher Education for 13.04.02 Electric Power and Electrical Engineering training area that is approved by the Order of the Ministry of Education and Science of the Russian Federation No. 147 dated 28.02.2018 (registered by the Ministry of Justice of the Russian Federation on 22.03.2018, registration number 50476).
- Professional Standard 40.180 Expert in designing electric drive systems, approved by the Order of the Ministry of Labor and Social Protection of the Russian Federation No. 354n dated 13/04/2017 (registered by the Ministry of Justice of the Russian Federation on 5.05.2017, registration No. 46626).

1.2 The purpose (mission) of the academic program

The mission of 13.04.02 Electric Power and Electrical Engineering academic program with a focus on Improving the Energy Efficiency of Electric Transport Systems includes the following: design and technological activities in the field of electric transport complexes and systems aimed at modeling, development, modernization of elements of power energy equipment for various rolling stock, as well as power supply systems and adaptation of modern energy-saving technologies for the needs electric transport. The modern electric transport complex includes both a power supply system and electrical equipment, automatic and automated control systems for transport systems. A significant part of the academic program is aimed at developing competencies in the field of autonomous electric vehicles. Also, within the framework of the program, various methods and means of increasing the energy efficiency of electric transport complexes are considered.

1.3 The language of the academic program

The Master's degree program is implemented in the state language of the Russian Federation.

1.4 The terms of mastering the academic program

The master's program includes 120 credits regardless of the applied educational technologies, the implementation of the master's program using a network form, the implementation of the master's program according to an individual curriculum, (with the exception of accelerated training).

Obtaining education in accordance with the full-time program, regardless of the educational technologies, lasts 2 years including the vacations after passing the state final certification.

The master's program implemented during one academic year includes no more than 70 credits.

1.5 E-learning and distance learning technologies

When implementing the academic program, e-learning and distance learning technologies are used via the electronic informational and educational environment of the Novosibirsk State Technical University (hereinafter - NSTU).

1.6 Network form of the academic program

The academic program is carried out by the organization independently.

1.7 Documents regulating the content and organization of the educational process

The major professional academic program represents a set of major educational characteristics (the scope, the content, the planned results), organizational and pedagogical conditions, forms of certification, which is presented in the following documents:

- general characteristics of the major professional academic program of higher education;
- curriculum;
- calendar training schedule;
- disciplines (modules) work program;
- practice work program;
- assessment materials in the form of assessment funds for disciplines and practice;
- programs and evaluation materials in the form of evaluation funds of the state final certification;
- teaching materials.

Information about the academic program is available on NSTU official website at <http://www.nstu.ru/sveden/education>.

The set of documents for the academic program is updated annually, taking into account the development of science, culture, economy, technology, and the social area.

1.8 Distinctive features of the academic program

Improving the Energy Efficiency of Electric Transport Systems academic program for 13.04.02 Electric Power and Electrical Engineering training area has the following distinctive features:

- it takes the regional characteristics of graduates professional activity and employers needs into account;
- it is professionally orientated towards design and operation of electrical engineering, power supply, automation systems and mechanization of production in the field of electric transport, graduates carry out their professional activities;
- it suggests comprehensive solution to the problems of using energy and resources in the electric transport complex, developed complex tasks in the efficient use of energy and resources in electric transport systems and complexes;
- it possesses a set of functions of professional activity, which make it possible to solve a wide range of tasks, both in the elements of electric transport complexes (traction power supply systems, rolling stock, organization of transportation, etc.), and in promising types of electric transport (electric vehicles, hybrid cars) and transport infrastructure.

1.9. Demand for graduates

Graduates of the academic program are in demand at enterprises and organizations that produce and operate equipment and rolling stock of electric vehicles; in engineering firms and design projects, technical research of electric transport complexes, development of new technologies and new solutions in the field of traditional and future electric transport, its infrastructure. In the Novosibirsk Region, such enterprises are the Novosibirsk Metro Municipal Unitary Enterprise, Gorelektrotransport Municipal Enterprise, Elektroagregat JSC, NPK IMPULS-Project CJSC, and others.

2. CHARACTERISTICS OF GRADUATES PROFESSIONAL ACTIVITY

2.1 The areas, field, types of tasks, tasks and objects of graduates professional activity

Table 2.1.1 represents the areas, field and professional activity types specified for Improving the Energy Efficiency of Electric Transport Systems academic program for 13.04.02 Electric Power and Electrical Engineering.

Table 2.1.1

Professional activity area(s) (according to the Register of professional activity areas and types)	Professional activity field	Professional activity types of tasks	Professional activity tasks	Professional activity object(s) (branch(es) of knowledge)
40	in the field of design and operation of electric power systems, electrical complexes, power supply systems, automation and mechanization of production	design	development and analysis of generalized problem solutions	electric drive of mechanisms and technological complexes, including electric machines, power converters, interface, control and regulating devices in all industries farms
				electric transport
40	in the field of design and operation of electric power systems, electrical complexes, power supply systems, automation and mechanization of production	technological	development of measures for the efficient use of energy and raw materials	electric transport

2.2. The list of professional standards

The list of professional standards correlates with the major professional academic program in accordance with the register of professional standards (list of professional activity types). The register is published in the Professional Standards section on the Ministry of Labor and Social Protection of the Russian Federation website (<http://profstandart.rosmintrud.ru>). The list of professional standards corresponds to the field(s) of graduates' professional activity.

Table 2.2.1

Professional standard code and name	generalized job function			job function		
	code	name	qualification level	name	code	qualification level (sublevel)

40.180 Specialist in the design of electric drive system	C	Developme nt of a design for an electric drive system	7	Development of a concept for an electric drive system	C/01. 7	7
				Provision of measures for the protection of copyright for solutions contained in the developed project	C/05. 7	7

Table 2.2.1 represents the possible names of positions and professions according to professional standards). These generalized job functions are distinguished to form professional competencies at NSTU:

40.180 Specialist in the design of electric drive systems:

Head of the design department;
Team leader.

3. THE REQUIREMENTS FOR PROGRAM MASTERING

3.1 Assessment of competencies formation includes the following:

- current monitoring of progress;
- intermediate students certification;
- state final certification of graduates.

Current control and intermediate certification in disciplines and practice is carried out on the basis of a point-rating system. The forms of intermediate students certification are determined by the curriculum for every discipline. The certification rules are determined by the work programs and are explained to the students during the first month of studying the discipline.

The assessment materials include standard tasks, control papers, tests and other control methods that allow assessing the acquired competencies formation. Students are certified for the compliance of their personal achievements with the requirements for academic program mastering. Evaluation materials are developed and approved by the departments that provide the educational process with the academic program.

3.2. The set of the planned learning outcomes in disciplines (modules) and practices ensures the formation of all the competencies during the master's program.

State final certification includes the preparation for the defense and defense of the final qualifying work.

Requirements for the content, scope and structure of the final qualifying work as well as the state exam are determined by the state final certification program.

4. THE STRUCTURE AND CONTENT OF THE ACADEMIC PROGRAM

4.1. The Structure of the academic program

The structure of the academic program includes the mandatory part and the part which is formed by the participants of educational process.

Table 4.1.1

The structure of academic program	Program scope, credits
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Section 1	Disciplines (modules)	62
Section 2	Practices	52
Section 3	State final certification	6
The scope of academic program		120

4.2. Mandatory part of the Master's program

The scope of the mandatory part accounts for at least 10% of the total program scope without including the scope of the state final certification.

4.3. Contact work

Educational activities in accordance with the program are carried out in the form of contact work of students with the teaching staff.

The minimum amount of contact work during training period is established by NSTU local act.

4.4. Elective subjects and additional courses

Students are provided with the opportunity to study elective subjects (modules) and additional courses in accordance with NSTU local regulatory act.

Elective subjects (modules) chosen by students are mandatory for studying.

The additional courses chosen by the students are mandatory for studying.

4.5. Characteristics of disciplines content

The content of the disciplines (modules) and practice provided by the curriculum is determined by the requirements for academic program mastering.

4.6. Applied educational technologies

Lectures, practical and laboratory classes are carried out to form the universal, general professional and professional competencies stated by the major academic program.

When organizing the educational process, active and interactive classes are used.

Specific types of educational technologies are defined in the work programs of the disciplines.

The curriculum provides the independent students work which is ensured with the necessary teaching materials available in NSTU electronic information and educational environment.

4.7. Practical training of students

Students practical training is organized by:

- practical classes, workshops, laboratory classes which ensure students participation in individual elements of work related to their future professional activities. These disciplines form general professional and professional competencies of students;

- practical classes according to the curriculum of Applied Information Systems and Technologies academic program for 13.04.02 Electric Power and Electrical Engineering training area.

4.8. Practice organization

To achieve the planned results of mastering the academic program, the following types of practices are stated:

- Educational: Educational practice: practice for obtaining primary skills of research work,

- Educational: Educational practice: practice for obtaining primary skills of working with software used in the area of professional activity,
- Practical: Practical placement: project activities,
- Practical: Practical placement: technological practice,
- Practical: Practical placement: pre-diploma work.

5. CONDITIONS FOR THE IMPLEMENTATION OF THE ACADEMIC PROGRAM

The conditions for the implementation of the academic program meet the requirements of the Federal State Educational Standard of Higher Education for 13.04.02 Electric Power and Electrical Engineering training area.

The average annual number of NSTU teaching staff publications equals 2 in Web of Science or Scopus journals and 20 in Russian Science Citation Index journals during the master's program per 100 scientific and pedagogical employees.

6. PECULIARITIES OF ORGANIZING EDUCATIONAL ACTIVITIES FOR DISABLED PEOPLE

If there are disabled people among the students, the academic program is adapted according to the special educational needs of such students.

The period of studying in accordance with an individual curriculum for disabled people may be extended at their request by no more than six months compared to the period of the corresponding form of education.

The master's program scope in the individual curriculum for disabled people, regardless of the form of study, cannot exceed 70 credits during one academic year.

At the request, NSTU provides disabled people the opportunity to undergo a master's program according to the peculiarities of their psychophysical development and individual capabilities. The developmental disorders correction and social adaptation are provided if necessary.

The individual program to support the students educational activities is made up in cases of inclusive education.