



# **Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan**

## **Qualification requirements for “60711500-Mechatronics and robotics” undergraduate educational program**

Tashkent - 2022



## Preface

### 1. Designed and incorporated by

- Tashkent State Technical University named after Islam Karimov
- “Uzeltexsanoat” association

### 2. Approved and implemented by

Meeting of the Coordinating Council for the activities of educational and methodological associations in the field of higher and secondary special, vocational education under the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan dated August \_\_\_\_, 202\_\_ approved.

### 3. Introduced by

Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan.

These Qualification Requirements are developed in accordance with the National Qualifications Framework of the Republic of Uzbekistan and are an official normative and methodological document "State Standard of Higher Education. Basic Rules", "Directions and specialties of higher education, classifier" is calculated.

The Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan has the right to officially publish qualification requirements in the territory of the Republic of Uzbekistan.



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## **1. 60711500- General classification of bachelor's degree programs in mechatronics and robotics**

**60711500**-Training of bachelors in the field of mechatronics and robotics is carried out in the form of full-time, evening(part-time) and part-time education. Training in all forms of education is organized on the basis of a credit-module system. The standard duration of the bachelor's degree program is 4 years in full-time education, 4.5 years in evening education, 5 years in part-time education, 5 years in distance learning.

### **1.1. Field of application**

#### **1.1.1. Application of qualification requirements in the field of mechatronics and robotics education.**

Qualification requirement 60711500-represents a set of requirements for all higher education institutions that prepare bachelors in the field of mechatronics and robotics.

#### **1.1.2. The main users of the qualification requirement:**

-The development and updating of qualification requirements, curricula and science programs in this area of education, on the basis of which is responsible for the effective implementation of the educational process and meets the scope of training of graduates within its competence. The staff of the higher educational organization (rector, vice-rectors, head of the educational department, deans, and heads of departments) and professors and teachers;

-requirements of higher education institutions that master the curriculum and science programs in the field of education;

-State attestation commissions that assess the level of preparation of undergraduate graduates;

-Competent state bodies for education management:

- Competent state bodies providing funding for higher education institutions

- Competent state bodies for accreditation and quality control of the higher education system;

-personnel customers and employers' organizations and enterprises;

-Applicants to higher education institutions, their parents and other stakeholders.



## **1.2. 60711500- General classification of bachelor's degree programs in mechatronics and robotics.**

### **1.2.1. 60711500-Fields of professional activity of bachelors of education in mechatronics and robotics.**

**60711500** - in the field of mechatronics and robotics education fields of professional activity. Mechatronics and robotics is a field of science and technology, the structure of mechatronic modules, their components, microprocessor control system, software, design, maintenance and diagnostics of mechatronic and robotics systems, testing and covers a set of complex issues related to exploitation and their effective use.

#### **1.2.2. 60711500- Objects of professional activity of bachelors in the field of education of mechatronics and robotics.**

-Governmental and non-governmental organizations, enterprises and institutions, companies, production associations, etc. .;

-technical systems, aggregates, machines and complexes based on mechatronic modules used as robotic manipulators, sensory sensors, executive and control systems;

-Mechatronic and robotic systems used in industrial enterprises and non-industrial sectors, as well as software and algorithmic software required for their design and management, efficient processes of their use;

-Means of technical support of scientific and research activities: the educational process in professional colleges.

**60711500**- In the field of mechatronics and robotics after the pedagogical retraining of bachelor's degree graduates, they are engaged in pedagogical activities for the teaching of general and specialized subjects in vocational education institutions, determined by the competent authorities of education, will have the right to use. The bachelor's degree in vocational education is an exception.

#### **1.2.3. 60711500-Types of professional activities of bachelors in the field of education in mechatronics and robotics.**

- Design activity;
- Production technological activity;
- Research activities;
- Assembly and adjustment works;



- Operation and maintenance activities.

**60711500 - Professional duties of bachelors in the field of mechatronics and robotics education.**

**60711500-** In the field of mechatronics and robotics education and the fields in accordance with the 6th qualification level of the National Qualifications Framework, objects and types of bachelor's professional activities, the bachelor must be able to perform the following professional tasks.

**In design and construction activities:**

-development of requirements for mechatronic and robotic systems and their components, process automation and development of a project for testing and operation of their engineering systems.

-design of structural elements, drives, sensors, microprocessor control devices and individual parts of the system.

-Organization of multi-component systems consisting of elements of work equipment, robots and technological equipment and the definition and formalization of their functions;

-Designing software to solve tasks related to management and design issues.

-Design and research of mathematical, informational and imitation models on the topic of experimental design and practical work;

-Development of design and program documentation;

-Must be able to apply international and professional standards of robotic technology in practice, modern paradigms and methodologies and computational tools in accordance with the training specialty.

**In the technological activity of production:**

-Development and application of robotic technological processes;

-development and implementation of quality management processes for industrial production activities;

-Environmental protection of production processes, fire safety, occupational safety.

-Development and use of field-appropriate systems in scientific and research activities;



-Have the ability to plan and perform work on repair, maintenance, assembly and commissioning of technical means and devices of mechatronic and robotic systems.

**Organizational and management activities:**

-Development of methods and mechanisms for monitoring and quality assessment of production processes associated with the creation and operation of robotic systems in industrial production;

-Development of mechatronic and robotic equipment and resources required for the implementation of production processes;

-Participate in the control of production processes to ensure compliance with environmental and occupational safety requirements;

-Implementation of engineering and design solutions;

-Organizing the work of the team of performers;

-organization and management of primary design, technological or production work;

-Must have the ability to create a work plan for the activities performed and evaluate the results of its implementation, monitoring and implementation.

**Research activities:**

- Participate in the analysis of the state of the objects of activity using modern methods and tools;

- Participate in the design, development, testing and effective use of facilities, processes, systems, equipment and facilities in the field of engineering;

- Participate in research on the reduction of inefficient time, labor and material resources, the selection of rational technological processes;

- Study of special literature in the field of engineering education, scientific and technical data, scientific sources of information in the field of science and technology, obtained abroad and in our country;

- Preparation of data for analysis, calculations and compilation of scientific publications;

- Participation in the collection, processing, analysis and systematization of scientific and technical data on the topic;

- Participation in the implementation of research results and developments.

**Collection setup activities:**

-Have the ability to plan and perform work on the assembly, adjustment and commissioning of mechatronic modules and robotic equipment.



### **Operation and maintenance activities:**

- Operation, repair and maintenance of mechatronic modules and robots;
- Have the ability to test, diagnose, and operate mechatronic modules, robots, and automation tools.

## **2. 60711500-Requirements for professional components of bachelors in the field of mechatronics and robotics education**

### **2.1. General competencies:**

- Knowledge of current issues of public policy, ability to independently analyze socio-economic problems and processes;
- To understand the essence of documents and works related to professional activity in one of the foreign languages, to have the necessary knowledge in the framework of professional activity in natural sciences and to be able to use them in professional activity on a modern scientific basis;
- Be able to apply information technology in their professional activities, have mastered the methods of collecting, storing, processing and using information, be able to make independent decisions in their activities;
- Be able to independently acquire new knowledge, work on themselves and organize work on a scientific basis;
- To have an idea of a healthy lifestyle and the need to follow it.

### **Professional components:**

- Search, analysis of normative legal documents and acquire skills in their professional activity;
- Have the skills to develop methods and mechanisms for monitoring and quality assessment of production processes associated with the creation and use of modern mechatronic and robotic systems;
- Able to develop and research mathematical, informational and immaterial models on the topic of experimental design and practical work;
- have the ability to develop project and program documentation;
- use of modern communication, information and computer technologies in design, development of design and program documentation;
- Have the ability to conduct tests to determine the operating parameters of the executive devices of mechatronic and robotic systems;





- To know the ability to apply in practice the international and professional standards of robotics technology, modern paradigms and methodologies, instrumental and computational tools in accordance with the specialty of training
  - Have process control skills in mechatronic and robotic systems;
  - Have the ability to monitor compliance with technological discipline in the operation of mechatronic and robotic systems;
  - Know how to develop and implement measures for the rational use of energy resources in mechatronic and robotic systems;
  - Study of special literature in the field of mechatronic and robotics, scientific and technical information, achievements in the field of science and technology abroad and in our country;
  - Knowledge of the rules and technology of installation, adjustment, testing and commissioning of mechatronic and robotic systems and equipment;
  - To lead the work team.
  - Have the skills to check the technical condition of mechatronic and robotic systems, structures and equipment and assess the residual resource;
  - Have the skills to follow a code of professional ethics;
  - To work in design institutes, to have the skills to participate in the demonstration of the results of scientific research at innovative exhibition fairs.



## **Bibliographic data**

UDK: 621.865

Group: T 55

OKC: 01.040.01

### **Key words:**

Type of professional activity, competence, direction of education, object of professional activity, field of professional activity, basic curriculum and study programs of bachelor, profile, learning outcomes, study period, mechatronics, robotics, executive and sensing elements, control system, qualification requirements, undergraduate learning process, quality assessment and control, independent education, production, organizational management activities, qualification practice, graduate work, state certification, academic sciences block, higher education institution, educational process, management process, production, design, research process.