

MINISTRY OF HIGHER EDUCATION AND SCIENCE OF THE REPUBLIC OF  
KAZAKHSTAN  
NON-COMMERCIAL JOINT STOCK COMPANY "ALMATY UNIVERSITY OF  
POWER ENERGY AND COMMUNICATION NAMED AFTER GUMARBEK DAUKEEV"  
Institute of Automation and Information Technology



"AGREED"

Director GKP on PHV  
"City Polyclinic No. 15"

Utezhanova A.M.

2025

"Approved"

Rector of AUPET

G. Nygymetov

2025

MODULAR EDUCATIONAL PROGRAM

6B07125 - BIOTECHNICAL AND MEDICAL SYSTEMS AND DEVICES

Education field code and classification - 6B07 Engineering, Manufacturing and Construction  
Code and classification of fields of education - 6B071 Engineering and Engineering  
Name of education programme groups - B064-Mechanics and Metalworking

Bachelor of Engineering and Technology in Biotechnical and Medical Systems and Devices

ISCED level: 6

NQF level: 6

ORC level: 6

Study period: 4 years

Credit volume: 240

Almaty 2025

Modular educational programme "6B07125 - Biotechnical and Medical Systems and Devices" was developed on the basis of the Law of the Republic of Kazakhstan "On Education" from 27.07.2007 and normative documents: State compulsory standard of postgraduate education (Order of the Minister of Education and Science of RK dated October 31, 2018 № 604), Standard rules of activity of organization of higher and postgraduate education (Order of the Minister of Education and Science of RK dated October 30, 2018 № 595), Rules of organization of educational process on credit technology of education (Order of MES RK dated 20.04.2011 № 152, with amendments dated October 12, 2018 № 563), National qualifications framework (Approved by the minutes of March 16, 2016 Republican trilateral commission).

Head of the Educational Programme S.S. Zhusupbekov

The programme was considered and approved at the meeting of the AC Department protocol No11 dated 06.05.2025.

Head of the AC Department  Abzhanova L.K.

The program was approved at a meeting of the Academic Council of the Institute of Automation and Information Technology. Protocol No 10. dated 12.05.2025

Director  I. Fedorenko

The educational programme was considered and approved by the Academic Council of the AUES, Protocol No. 11 of 23. 05.2025.

The educational programme has been reviewed and approved

Director GKP on PHV "City Polyclinic No. 15"



Utezhanova A.M.

## List of abbreviations and designations

BC	- Basic competence
BM	- Basic module
HE	- Higher education
SCSE	- State compulsory standard of education
EQF	- European qualification framework
NCO	- National Classification of Occupations
RK	- Republic of Kazakhstan
NQF	- National Qualifications Framework
NQS	- National Qualifications System
GEM	- General education module
EP	- Education programme
GED	- General education disciplines
MC	- Mandatory component
UC	- The university component
BD	- Basic disciplines
OC	- Optional component
PD	- Professional disciplines
IET	- Individual educational trajectory
FC	- Final certification
SQF	- Sectoral qualifications framework
PS	- Professional standard
PC	- Professional competence
CO	- Competencies
LO	- Learning outcome
CW	- Course work
CGW	- Calculated and graphical work
IWS	- Independent work of students
IWST	- Independent work of students with the teacher
CED	- Catalogue of elective disciplines

## 1. Information on the education programme

No	Field name	Note
1	Code and classification of the field of education	6B07 Engineering, manufacturing and construction industries
2	Code and classification of training areas	6B071 Engineering and Engineering
3	Education Programme Group	B064-Mechanics and metalworking
4	Name of educational programme	6B07110 Biotechnical and medical systems and apparatus
5	Brief description of the education programme	The educational programme "Biotechnical and Medical Systems and Devices" ensures training of specialists in demand, who are able to develop and design medical devices and systems, including medical information systems, as well as maintain and operate them in medical institutions of various profiles, design, market and debug medical devices using modern information technologies, conduct scientific research on advanced medical technologies, and conduct research in the field of medical technologies.
6	Purpose of the EP	To meet the needs of the Republic of Kazakhstan for qualified personnel by training highly qualified specialists in the development and production of medical equipment, operation and maintenance of medical systems, complexes and devices for enterprises and institutions of health care.
7	ISCED level	6
8	NQF level	6
9	ORC level	6
10	<p>List of competences of the educational programme:</p> <p>ON1: Know: social and ethical values based on public opinion, traditions, customs, social norms and be guided by them in their professional activities; traditions and culture of the peoples of Kazakhstan; human and civil rights and freedoms; basics of the RK Constitution, ethical and legal norms regulating human attitude to the individual, society, environment; be able to take them into account when developing environmental and social projects; trends of social development of society; basics of physical culture and principles of healthy lifestyle</p> <p>ON2: Have an understanding of: ethical and spiritual values; sociological approaches to the individual, basic patterns and forms of regulation of social behaviour; essence of power and political life, political relations and processes, role of political systems in the life of society and various social groups; role of consciousness and self-awareness in the behaviour, communication and activities of people, formation and formation of personality.</p> <p>ON3: Has a holistic view of the processes and phenomena occurring in inanimate and animate nature, understands the possibilities of modern scientific methods of knowledge of nature, is able to organise his work on a scientific basis, has knowledge of the basics of production relations and the principles of management, taking into account technical, financial and human factors; is ready for cooperation with colleagues and working in a team, familiar with management methods, can organise the work of performers, find and make management decisions in conditions of different opinions.</p> <p>ON4: He/she has a culture of thinking, knows its general laws, is able to formulate its results correctly (logically) in written and oral speech; is capable of reassessing his/her experience under the conditions of scientific development and changing social practice, of analysing his/her capabilities, is able to acquire new knowledge, using modern information</p>	

and educational technologies;

ON5: The ability to use modern information technologies, to manage information using applications in the field of activity; to use network computer technologies, databases and application software packages in their subject area, owns computer methods of collecting, storing and processing (editing) information used in the field of professional activity.

BC1: The ability to actually use the state language, a language of inter-ethnic communication in professional activities.

BC2: The ability to understand the requirements for the development and justification of medical, ergonomic, schematic, software and design specifications for medical devices, biotechnical systems and apparatuses, technical means of biological experiments and individual assemblies of these technical means;

BC3: The ability to professionally operate modern equipment, a fleet of medical equipment for various purposes, scope and conditions of use of the main classes of devices, apparatus, systems and complexes, their characteristics, computer systems (in accordance with the objectives of the programme), and to use safety, industrial hygiene, fire safety and labour protection regulations.

BC4: Ability to possess methods of automatic control and information processing in biotechnical complexes, diagnostic and expert systems, health care ACS; methods of hardware, instrumentation and system medical-biological research for scientific experiments and clinical trials of medical devices, apparatus and systems; use of algorithms and programs for medical research.

BC5: The ability to use the fundamentals and methods to solve management problems; the ability to carry out project documentation in a computer graphics software environment for various types of projects.

BC6: Ability to implement in the production of new samples of biomedical equipment; possess organizational and technological requirements for the production and repair of electronic biomedical equipment, equipment and devices; methods to organize human work with technical means on the basis of provisions of engineering psychology and work psychology.

BC7: Ability to understand the principles of construction of biotechnical systems combining biological and technical links, basics of bionic methodology of studying living systems and synthesis of biotechnical complexes, methods of calculation and design of medical and biological electronic equipment for various purposes.

BC8: Ability to conduct system analysis, modelling, design and construction of biomedical systems; build information applications using modern tools, analyse, simulate and design biomedical systems in different hardware platforms; analyse the subject area and identify tasks for which the use of modern technology is appropriate.

PC1: The ability to coordinate measuring transducers with biological objects, methods of analysis of input circuits in biomedical engineering;

PC2: The ability to apply various data mining techniques and understand the basic process and mechanics of data mining;

PC3: The ability to select the means for the validation, the metrological assurance and the safe operation of instruments, apparatus and systems under development, strategic recommendations based on the results of data mining;

PC4: The ability to carry out system analysis, modelling, analysis and use basic techniques for processing and presenting experimental data;

PC5: The ability to search for, store, process and analyse information from a variety of sources and databases, and present it in the required format using information, computer and network technology;

PC6: The ability to conduct a pre-feasibility study of biomedical and environmental engineering projects, the ability to collect and analyse input data for the calculation and design of parts, components and assemblies of biotechnical systems, biomedical and environmental engineering;

PC7: The ability to develop design and technical documentation, to formalise completed

design and development work in the subject area of biotechnical systems and technologies.

The learning outcomes of the educational programme:

LO1: Master the culture of thinking, know the Constitution of RK, ethical and legal norms, social and ethical values, traditions, customs, traditions and culture of the peoples of Kazakhstan, social norms and be guided by them in your professional activity

LO2: Proficiency in the state language and one of the common foreign languages, written and spoken language, basic social and economic knowledge, ways and methods of organisation of production and compliance with safety, health and environmental regulations;

LO3: Master modern information technology, methods of collecting, storing and processing information, and software used in the design and operation of biotechnical and medical systems;

LO4: Master the element base of medical devices, apparatus and systems; basic types of materials used in medical devices and apparatus; basic methods and means of measurement of electrical, radiotechnical and biophysical quantities and parameters;

LO5: Proficiency in programming in high-level languages, microcontroller programming tools and languages, simulation and research software for biotechnical and medical systems;

LO6: Master the methods of automatic control and information processing in biotechnical complexes, diagnostic and expert systems, and health care management systems;

LO7: Apply intelligent intelligence methods to analyse, simulate and manage biomedical systems;

LO8: Carry out maintenance and repair of biotechnical and medical apparatus and systems, instruments, devices and facilities of biomedical technology;

LO9: To carry out technical quality control of biomedical technology products in accordance with established standards;

LO10: Develop and conduct pre-feasibility studies for biomedical equipment projects, collect and analyse input data for the calculation and design of parts, components and assemblies of biotechnical systems and biomedical equipment;

LO11: Develop design and technical documentation and formalise the completed design and development work in the subject area of biotechnical systems and technologies;

LO12: Carry out service maintenance of the main types of medical equipment; use the basic provisions of current regulatory documentation for modern technological processes in the production of biomedical apparatus.

11	Form of study	Full-time
	Language of instruction	Kazakh, Russian, English
12	Volume of loans	240
	Academic degree awarded	Bachelor of Engineering and Technology in the Biotechnical and Medical Systems and Devices programme

