

**NAO "Kazakh National Research Technical  
University named after K.Satpayev"**

Institute of Energy and Mechanical Engineering  
Department of Engineering Mechanics and Modeling

**EDUCATIONAL PROGRAM**

**6B07106 - "Mechanical Engineering"**

Code and classification of the field of education: 6B07 - Engineering, manufacturing and construction industries

Code and classification of training areas: 6B071 - Engineering and Engineering

Group of educational programs: B064 - «Mechanics and metal working»

The level of the NRK: 6B

**ORC Level: 6**

Duration of study: 4 years

Volume of credits: 242

## Passport of the educational program

educational programs «6B07106 - **Mechanical Engineering** »

### 4.1. General information

№	Title	
1	Code and classification of the field of education	6B07 Engineering, manufacturing and construction industries
2	Code and classification of the direction of training	6B071 Engineering and Engineering
3	Group of educational programs	B064 Mechanics and metalworking
4	Name of the educational program	6B07106 - <b>Mechanical Engineering</b>
5	Short description	<p>The educational program "<b>Mechanical Engineering</b>" is aimed at preparing bachelors to solve a wide range of engineering problems of mechanics based on fundamental knowledge in mathematics, mechanics, physics, chemistry and engineering principles using modern analytical, experimental and numerical methods and methods of mathematical and computer modeling. Thus, the mission of the "Mechanical Engineering" educational program is to provide the market with highly qualified specialists with fundamental knowledge in the fields of natural sciences, engineering mechanics and computer modeling to work in the field of high-tech engineering.</p> <p>The curriculum of the "<b>Mechanical Engineering</b>" educational program is developed in accordance with the curricula of the "Mechanical Engineering" educational program of the best research and engineering universities in the world, such as Massachusetts Institute of Technology – MIT, Stanford University, University of Cambridge, Georgia Institute of Technology, Technical University of Munich, Pennsylvania State University, Tokyo University, Nanyang Technological University (Singapore), and others, taking into account the current trends in technology development.</p> <p>The basic education in mathematics, the laws of physics and mechanics underlying modern engineering design, numerical and computer modeling methods and information technologies will allow future specialists to easily integrate into the workflow of almost any industry, it is easy enough to master a wide range of new technologies.</p> <p>In the first two courses, students have the opportunity to receive fundamental education in mathematics, physics, mechanics, chemistry, information and digital technologies, Kazakh and English. These basic sciences are the basis of any technology and will allow students who have mastered them to easily master new technologies and retrain for other modern specialties.</p>

		<p>At senior courses, students study in-depth special courses in mechanics and engineering and gain skills in numerical and computer modeling, design of machine elements and structures, design of mechanisms and mechanical systems, numerical modeling and research of various mechanical processes and phenomena, development and creation of robots and manipulators. Primary attention is paid to the acquisition by graduates of skills in developing computer models of various engineering tasks and hydraulic systems, complex mechanical, thermal or mass transfer processes in various industries using modern computing and information technologies.</p> <p>Students undergo practical training in research institutes, state and departmental structures, in such companies as Kazatomprom JSC, Kazmunaygas JSC, at the Institute of Mechanics and Machine Science, at the Institute of Mathematics and Mathematical Modeling, etc. According to the academic mobility program, the best students have the opportunity to study at leading foreign universities according to the appropriate educational program.</p> <p>At all levels of training, teaching is conducted by highly qualified teaching staff, among them there are graduates of universities in the USA, Europe, Russia and other countries</p> <p>Graduates can choose different career paths. Some may go into industry directly as practicing engineers, while others may continue to study for a master's degree in mechanical engineering or applied sciences. Many make a career in business or in public activities.</p>
6	Purpose of the OP	Training of highly qualified personnel: having fundamental knowledge in mathematics, mechanics, physics and chemistry, modeling methods and information technologies; able to apply knowledge and skills for the development and design of new mechanisms and mechanical devices, autonomous mechanisms and robots, mechanical and thermal systems, heat and mass transfer processes and installations, converters and batteries of renewable sources energy; able to use knowledge to manage modern technological processes in mechanical engineering and energy and introduce the most effective technologies into production.
7	Type of OP	bachelor course
8	The level of the NRK	6B
9	ORC Level	6
10	Distinctive features of the OP	<p>Paying special attention to training in mathematics, mechanics, physics, modern information technologies and methods of analytical, experimental and numerical modeling and research, skills in developing physical, mathematical and computer models of complex mechanical and physical processes and engineering tasks.</p> <p>Graduates will have the opportunity to: use, along with methods of theoretical and experimental research of mechanics problems, methods of mathematical and computer modeling to solve engineering and technical problems; develop models of complex</p>

		mechanical and physico-chemical processes and phenomena and create computer codes to solve them.
11	List of OP competencies	<p><b>General competencies</b></p> <ul style="list-style-type: none"> <li>• Knowledge of Kazakh, Russian and English languages for: free oral and written communication with a native speaker of a particular language on a professional topic and in a real-life situation; search for scientific and technical information in these languages; work with scientific and technical literature on engineering mechanics in these languages.</li> <li>• Mastery of critical systems thinking, transdisciplinarity and cross-functionality.</li> <li>• Possession of ICT competencies, the ability to develop software.</li> <li>• Mastery of skills: self-study; deepening of one's knowledge; being open to new information; system thinking and one's own judgment.</li> <li>• The ability to be tolerant of another nationality, race, religion, culture; the ability to conduct an intercultural dialogue.</li> <li>• Possession of communication skills, the ability to cooperate and work in a team.</li> <li>• Ability to work in a mode of high uncertainty and rapid change of task conditions; to work with consumer requests.</li> <li>• Possession of a broad socio-social, political and professional outlook; ability to use data from various sources and specialized literature, analyze and critically evaluate historical facts and events.</li> <li>• Knowledge of the basics of entrepreneurship and business economics, readiness for social mobility.</li> </ul> <p><b>Professional competencies</b></p> <ul style="list-style-type: none"> <li>• Possession of fundamental knowledge in mathematics, mechanics, physics and scientific principles.</li> <li>• The ability to independently construct adequate physical and mathematical models of mechanical processes and phenomena.</li> <li>• Ability to use mathematical models and computer mechanical processes for independent research of a wide range of engineering problems of mechanics and design of various mechanical and energy systems.</li> <li>• The ability to develop new mechanisms and devices, including autonomous mechanisms and robots.</li> <li>• Ability to work with high-tech laboratory and research equipment.</li> <li>• Knowledge of algorithmic languages and programming technology, computer modeling skills and research of complex physical and mechanical processes.</li> <li>• Proficiency in working as a designer in mechanical engineering, energy, transport, chemical production.</li> </ul>
12	Learning outcomes of the OP	<p>RO 1 – to search and study scientific and technical information on engineering mechanics in Kazakh (Russian) and English;</p> <p>RO 2 – express your opinion in writing and orally on the topic of engineering mechanics in Kazakh (Russian) and English;</p>

		<p>RO 3 – critically analyze historical sources, possess the skills of independent analysis of historical facts, identify alternative ways of posing and solving ideological issues in the history of human development;</p> <p>RO 4 – to program in a modern algorithmic programming language; to possess modern computer design tools;</p> <p>RO 5 – differentiate and integrate functions of one and many variables; apply integral theorems and elements of tensor analysis in problems of fluid and solid mechanics;</p> <p>RO 6 – to understand the fundamental physical foundations and laws of the universe in order to apply them with knowledge in the study and solution of engineering problems;</p> <p>RO 7 – perform calculations on the dynamics of bodies, the theory of mechanisms and machines and machine parts based on knowledge of the theories of differential and integral calculus, vector analysis;</p> <p>RO 8 – to conduct research and calculations on deformations of bodies, heat and mass transfer processes in thermal devices and reactors based on knowledge of mathematical analysis, differential equations, numerical methods of solid mechanics and fluid mechanics;</p> <p>RO 9 – have the skills to work with modern application software to determine the behavior of solids, fluid flow in pipes, channels and devices and use them to solve engineering problems;</p> <p>RO 10 – to develop and build physical and mathematical models of mechanical systems and thermal phenomena and processes in engines, heat exchange plants and chemical reactors;</p> <p>RO 11 – develop and design various mechanisms and machine parts, mechanical systems and devices, autonomous mechanisms and robots;</p> <p>RO12 – to choose optimal numerical methods and develop, create software that allows computer calculations, modeling and research, mechanical, hydraulic and heat and mass transfer problems in pipes, channels and devices;</p> <p>RO13 – to conduct independent research using analytical, experimental or numerical methods on the development and creation of new mechanical devices, robots, mass transfer or thermal devices.</p>
13	Form of training	Full - time
14	Duration of training	4 years
15	Volume of loans	242
16	Languages of instruction	Kazakh, Russian, English
17	Academic degree awarded	"Bachelor of Engineering and Technology" in the educational program "6B07106 - Engineering Mechanics".
18	Developers and authors	Prof. A. Kaltayev, assoc. prof.: S.K. Dzhabaev, M.S. Tungatarova