Institute _____ **Energy and Mechanical engineering** _____

Department __ **Mechanical engineering** _____

EDUCATIONAL PROGRAM

6B07105- Industrial engineering

the name of educational program

Code and name field of education:
6B07-Engineering, manufacturing and civil engineering
Code and classification direction of personnel training:
6B071-Engineering and engineering trades
Group of educational programs:
B064-Mechanics and metal working
EP purpose: 6
EP type: 6
Period of study: 4 years
Volume of the credits: 240

Almaty 2024

Educational program **6B07105 - Industrial engineering**
(the name of educational program)

was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes 12 dated « 22 » 04 2024.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes 6 dated « 19 » 04 2024.

Educational program 6B07105- Industrial engineering
(the name of educational program)
developed by Academic committee in the direction of "6B071-Engineering and engineering trades"

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
Yelemessov K.	Professor	Director of the Institute of Energy and Mechanical Engineering named after A.Burkitbayev	NAO KazNRTU named after K.I. Satpayev	
Teaching staff:				
Nugman E.Z.	Doctor PhD, Assoc. Prof.	Head of the Department of "Mechanical Engineering"	Institute of Energy and Mechanical Engineering named after A.Burkitbayev	
Uderbayeva A.E.	Doctor PhD	Assoc. Professor	Department of Mechanical Engineering	
Employers:				
Dyussebayev I.M.	Doctor PhD	Chief Engineer	LLP, Almaty plant "Electroshield"	
Students				
Baybatsha A.K.		1st year doctoral student	Department of "Mechanical Engineering"	

Table of contents

List of abbreviations and designate

ECTS	European Credit Transfer and Accumulation System
BD	Basic disciplines
HEI	Higher education institution
SMSE	State mandatory standard of education
KazNRTU	K. I. Satpayev Kazakh National Research Technical University
MEP	Modular educational program
NJSC	Non-profit joint stock Company
GED	General education disciplines
EP	Educational program
PD	Profile disciplines
WC	Working curriculum
IWS	Independent work of a student
EMC	Educational and Methodological Council
AC	Academic council

1 Description of educational program

A specialist who develops a virtual prototype of products and technological processes (for example, for remote consulting of personnel, visual demonstration of the product to the customer at the design stage).

The professional activity of graduates of the program is directed to the field of mechanical engineering, additive manufacturing.

The direction of the specialty and specialization program covers engineering and engineering.

The field of professional activity of bachelors includes sections of science and technology containing a set of tools, techniques, methods and methods of human activity aimed at creating competitive engineering products and based on the use of modern methods and means of design, mathematical, physical and computer modeling of technological processes.

Bachelors can perform the following types of professional activities:
- organizational and managerial;
-production and technological;
- design and engineering;
- settlement and design;
- experimental research.

Functions of professional activity of graduates:
- development and design of technological processes for the manufacture of various types of products, equipment, tooling, tools;
- standard control of regulatory and technical documentation;
- solving design, technological, organizational-technical and organizational-economic tasks;
- - maintenance, organization of preventive inspections and routine repairs of production facilities, measurements, tests and control;
- development of design, technological and operational documentation, new technologies, methods of testing equipment and tooling for specific industries;
- analysis of the state of production and assessment of the stability of product quality in order to further develop and improve the efficiency of the enterprise;
- conducting experiments, measurements, observations, implementation of research results and scientific developments.

Graduates are prepared to solve the following types of tasks according to the type of professional activity:
- organizational and managerial: organization of the production process, organization of the work of performers;
- setting goals and forming management tasks related to the implementation of professional functions;
-organization of production maintenance management of the production process taking into account technical, financial and human factors;
-development of management algorithms;
-accounting planning and reporting, development of a business plan of the enterprise, planning to improve production efficiency;

-production and technological: development, implementation and operation of system, resource-saving technologies; development and implementation of technological processes for processing and assembling products;
-automation of machine-building production; creation of continuous in-line production processes, automated complexes, flexible automated productions;
-introduction of highly efficient technological equipment, ensuring environmental friendliness of machine-building production;
- design and engineering: execution of design and graphic works in the design of automation systems, design of highly efficient technological equipment; justification of criteria for evaluating the technical and economic efficiency of the designed systems;
-development of design, design and technological documentation using modern methods of computer-aided design;
- design and design: development of design schemes for the design of equipment systems, tooling and tools;
-execution of calculations for use in design documentation; justification of calculation methods;
- experimental research:

Application of modern experimental methods for the study of processes occurring in machine-building production; research of new directions in the technology of modern mechanical engineering; research of types of processing in mechanical engineering; research of automation objects in the field of mechanical engineering; scientific substantiation of methods for ensuring the quality of manufactured products and increasing labor productivity;

Areas of professional activity

Directions of professional activity of a graduate of this specialty:
– technological processes of machine-building production;
– design and construction of various types of equipment, tooling and tools;
– repair and maintenance of production equipment, tooling and tools;
- experimental research works. The content of professional activity.

The content of professional activity includes a set of means, methods and methods of production and technological, design, experimental research, organizational, economic and managerial activities, as well as design and design activities aimed at manufacturing competitive engineering products based on the use of modern design methods.

Requirements for the Bachelor's key competencies.

The bachelor must:

have an idea: about the main equipment, tools, equipment used in mechanical engineering; about calculation and design methods; about modern methods and methods of obtaining blanks; about the development of technological processes; about the current state, trends and prospects for the development of mechanical engineering; about the types of CAD support; about the composition of design tasks; about the sanitary and hygienic basics of labor protection; about the main hazards and harmful conditions; ways of preventing and eliminating accidents; about fixed assets and working capital; about economic efficiency; about modern

forms and methods of organization and management of production;

2 The purpose and objectives of additional educational program

EP purpose:

The purpose of the educational program is the professional training of a graduate in the field of design, design and organization of machine-building production, the formation of a technically competent, socially responsible personality; possessing creative thinking, the ability to solve engineering problems, work in a team and having management competencies in the industrial sector.

EP tasks:

- formation of knowledge of modern information technologies;
- acquisition of theoretical and practical knowledge of computer-aided design of machine-building products;
- knowledge of methods and methods of mathematical and 3D modeling;
- acquisition of professional competencies in accordance with the requirements of industry professional standards;
- acquisition of knowledge of the basics of mechanical engineering technology, design of technological processes for the production of machines;
- formation of knowledge about the main trends in the development of mechanical engineering, the introduction of innovative digital technologies.

3 Requirements for evaluating the learning outcomes of an educational program

Description of mandatory standard requirements for graduating from a university and conferring an academic bachelor's degree: mastering at least 240 academic credits of theoretical training and final thesis

4 Passport of the educational program

4.1 General information

№	Название поля	Примечание
1	Code and name field of education	6B07- Engineering, manufacturing and civil engineering
2	Code and classification direction of personnel training	6B071- Engineering and engineering trades
3	Group of educational programs	B064- Mechanics and metal working
4	Name of the educational program	6B07105- Industrial engineering
5	Short description of the educational program	The professional activity of graduates of the program is directed to the field of mechanical engineering, additive manufacturing. In the educational program, students will receive professional knowledge of the basics of mechanical engineering technology,

		machining technology and machine assembly. They will acquire skills in designing machine structures and their parts, technological processes of machine production using modern software products (CAD/CAM/CAE).
6	EP purpose	Preparation of demanded, competitive and highly qualified bachelors in mechanical engineering; design, production and operation of machines aimed at their high quality and safety, high economic efficiency for the manufacturer and consumer
7	EP type	New
8	Level on NQF	6
9	Level on SQF	6
10	EP distinctive features	-
11	List of competencies of the educational program:	- Ability to apply general engineering knowledge, methods of mathematical analysis and modeling in professional activities; - Ability to analyze and evaluate both production and technological processes; - Willingness to use modern information technologies in the modeling of technological processes, mechanical engineering; - Willingness to apply modern calculation methods in the design of parts and assemblies of mechanical engineering products; - Willingness to use low-waste, innovative, additive technologies in mechanical engineering; - Willingness to apply methods of quality control of products and objects in the field of professional activity;
12	Learning outcomes of the educational program:	ON1- Apply basic knowledge of fundamental disciplines of mathematics, physics, chemistry, digital technologies in the design and preparation of machine-building production. ON2- Apply knowledge of economic laws, occupational safety and health, ecology, rules of moral development, culture of academic integrity at a professional level. ON3- Analyze, synthesize and design elements of machine structures using modern materials and methods for calculating structures for strength, rigidity and stability. ON4- To carry out technical preparation of production, to evaluate the quality of production processes and engineering products.

		ON5- Develop technical and technological documentation for the design and production of metalworking equipment, tooling and cutting tools. ON6-Apply the principles of interchangeability and rationing of standard connections in machines. ON7- Apply modern engineering materials, technologies and methods of design and production of blanks in mechanical engineering. ON8- Choose effective ways to implement the main technological processes and apply methods of processing machine parts based on additive technologies, automated design systems and production management. ON9- Use process modeling methods, software products and the latest technologies to solve engineering problems in the field of metalworking. ON10- Analyze and apply modern methods of economic regulation and production management, planning and organization of production. ON11- To use the laws of fluid and gas mechanics in the design and operation of technological equipment in the manufacture of machine-building products. ON12- The use of modern technical means and information technologies of machine-building production, advanced equipment, tooling and additive technologies.
13	Form of training	daytime
14	Period of study	4 years
15	Volume of the credits	240
16	Language of education	Kazakh, russian
17	The awarded academic degree	Bachelor of Engineering and technology
18	Developer(s) and authors:	The educational program was developed by the academic committee in the direction "6B071-Engineering and Engineering"

4.2 The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of discipline	Short description of discipline	Number of credits	The formed educational outcomes (codes)											
				ON1	ON2	ON3	ON4	ON5	ON6	ON7	ON8	ON9	ON10	ON11	ON12
Cycle of general education disciplines Optional component															
1	Fundamentals of anti-corruption culture and law	The course introduces students to the improvement of socio-economic relations of Kazakhstan society, psychological features of corrupt behavior. Special attention is paid to the formation of an anti-corruption culture, legal responsibility for acts of corruption in various spheres. The purpose of studying the discipline «Fundamentals of anti-corruption culture and law» is to increase public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Expected results: to realize the values of moral consciousness and follow moral norms in everyday practice; to work on improving the level of moral and legal culture; to use spiritual and moral mechanisms to prevent corruption.	5						v						
2	Fundamentals of economics and entrepreneurship	Discipline studies the foundations of economics and entrepreneurial activity from the point of view of science and law; features, problematic aspects and development prospects; the theory and practice of entrepreneurship as a system of economic and organizational relations of business structures; The readiness of entrepreneurs for innovative susceptibility. The discipline reveals the content of entrepreneurial activity, the stages of career, qualities, competencies and responsibility of the entrepreneur, theoretical and practical business planning and economic examination of business ideas, as well as the analysis of the risks of innovative development, the introduction of new technologies and technological solutions.	5						**v**						
3	Ecology and life safety	The discipline studies the tasks of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in the conditions of labor activity. Monitoring of the environment and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5						v						
4	Fundamentals of scientific research methods	The purpose of the discipline is to form the skills of organizing and planning scientific research, methods of conducting experimental research, methods of information processing. The discipline introduces students to the goals, objectives and stages of scientific research. The terms and concepts, the methodology of the experiment, mathematical methods of processing research results are considered. The concept of engineering, laboratory and industrial experiment, bench research. The discipline introduces the basics of the theory of solving inventive problems, algorithmic methods of finding	5					v							v

		technical solutions and their optimization. Highlights the main mathematical methods of optimization, the use of artificial intelligence capabilities to solve optimization problems; issues of search, accumulation and processing of scientific information.													
5	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5						v						
Cycle of basic disciplines University component															
6	General Chemistry	The purpose of the discipline is to study the basic concepts and laws of chemistry; fundamental laws of chemical thermodynamics and kinetics; quantum mechanical theory of atomic structure and chemical bond. Solutions and their types, redox processes, coordination compounds: formation, stability and properties. The structure of matter and the chemistry of the elements.	4	v											
7	Physics I	Objectives: to study the basic physical phenomena and laws of classical, modern physics; methods of physical research; the relationship of physics with other sciences. The following topics are considered: mechanics, dynamics of rotational motion of a solid body, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, transport phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell equations.	5	v											
8	Mathematics I	The course is based on the study of mathematical analysis in a volume that allows you to study elementary functions and solve the simplest geometric, physical and other applied problems. The main focus is on differential and integral calculus. The course sections include the differential calculus of functions of one variable, the derivative and differentials, the study of the behavior of functions, complex numbers, and polynomials. Indefinite integrals, their properties and methods of calculation. Certain integrals and their applications. Improper integrals.	5	v											
9	Physics II	The course studies the laws of physics and their practical application in professional activity. Solving theoretical and experimental-practical educational problems of physics for the formation of the foundations in solving professional problems. Assessment of the degree of accuracy of the results of experimental or theoretical research methods, modeling of physical condition using a computer, study of modern measuring equipment, development of skills for conducting test studies and processing their results, distribution of the physical content of applied tasks of the future specialty.	5	v								v			
10	Mathematics II	The discipline is a continuation of Mathematics 1. The course sections include elements of linear algebra and analytical geometry. The main issues of linear algebra are considered: linear and self-adjoint operators, quadratic forms, linear programming. Differential calculus of a function of several variables	5	v								v			

		and its applications. Multiple integrals. The theory of determinants and matrices, linear systems of equations, as well as elements of vector algebra. The elements of analytical geometry on the plane and in space are included.														
11	Introduction to engineering design	General provisions of the methodology of engineering design. Stages of creating cars. Design procedures. Principles of engineering design. Engineering design methods. Manufacturability of machine designs.	5	v												
12	The theoretical mechanics	Statics: reactions of communications; the theory of the moments; conditions of balance of flat and spatial systems of forces; the centre of grav-ity of a body. Kinematics: kinematics of a point; the elementary movements of a firm body; plane-parallel movement of a firm body; free movement of a firm body; complex movement of a point and a firm body. Dynamics: dynamics of a material point in inertial and not inertial systems of readout; mechanical system and its characteristics; the general theorems of dynam-ics of a material point and system; analytical dynamics; the theory of impact.	5			v			v							
13	Strength of materials	Stretching and compression. Stresses in cross sections and deformations of a straight rod. Mechanical properties of materials under tension and compression. Calculation of strength and stiffness in tension-compression. Geometric characteristics of flat sections. Shear and torsion. Calculation of strength and torsional stiffness. Bend. Normal and tangential bending stresses. Calculation of bending strength. Theory of stressed and deformed states. The limit state hypothesis. Complex resistance. Stability of the equilibrium of deformable systems. Dynamic load.	5			v				v						
14	Electrical and Electronic Engineering	The purpose of the discipline is to acquire theoretical and practical knowledge on the basics of electrical engineering and electronics. The basic laws of the processes occurring in electromagnetic and electronic circuits and methods for determining the electrical quantities characterizing these processes are studied. Methods of calculation of DC electric circuits are studied; analysis and calculation of linear AC circuits; analysis and calculation of magnetic circuits. Electromagnetic devices and electrical machines. Fundamentals of electronics and electrical measurements. The element base of modern electronic devices. Fundamentals of digital and microelectronics, microprocessor tools.	5									v				v
15	The theory of mechanisms and machines	The purpose of studying the discipline is to form the scientific foundations of students' knowledge of general methods of research and design of mechanisms of machines and devices, to prepare a scientific and theoretical basis for the development of special disciplines and the basics of modern technology Contents: Introduction. The basic concepts of the theory of mechanisms and machines. The main types of mechanisms. Structural analysis and synthesis of mechanisms. Synthesis of mechanisms with lower pairs. Kinematic analysis of mechanisms. Dynamics. Basic concepts. Kinetostatic (force) analysis of mechanisms. Dynamic analysis of mechanisms. Introduction to the theory of the highest kinematic pair. Mechanisms with higher kinematic pairs. Analysis and synthesis of gear mechanisms. Analysis and synthesis of cam mechanisms. Vibrations and vibrations in machines and mechanisms	5			v			v							
16	Economics of a machine-building enterprise	The purpose of the discipline is to acquire theoretical knowledge and practical skills of economic assessment of the company's activities. The discipline	5		v									v		

		studies the structure of a machine-building enterprise, fixed and current assets, production capacity of the enterprise, material and technical support of production, personnel, financial resources of production. The issues of forecasting and planning of production, calculation of production costs, production costs, economic efficiency, analysis and evaluation of the economic activity of the enterprise are studied.														
17	Qualimetry in mechanical engineering	The purpose of the discipline is to acquire the theoretical foundations of qualimetry and practical knowledge of quality analysis, organization of statistical quality control of engineering products. The regulatory framework of the technology for assessing the quality level, quality control methods are being studied. The nomenclature of product quality indicators, expert methods of quality assessment are considered. The skills of quality analysis, application of various assessment methods, organization of work in the field of quality assessment are acquired	5	v			v									
18	Basics of interchangeability	The purpose of the discipline is to acquire knowledge and practical skills on the basics of interchangeability, technical measurements, and machine manufacturing accuracy. Students acquire knowledge on accuracy of manufacturing of machines. The basic con-cepts of interchangeability. Concepts about the sizes, maximum deviations, admissions and landings. Principles of construction of system of admissions and landings. Calcu-lation and a choice of landings. Normaliza-tion, methods and means of measurements and the control of rejections of the form, an arrangement, a roughness and a sinuosity of a surface of a detail. Methods and means of measurements and the control of smooth cylindrical connections; carving connec-tions; conic connections and tooth gearings. Substantive provisions of the theory and practice of calculation of dimensional cir-cuits.	5						v							
19	Probabilistic models in industrial engineering	The purpose of the discipline is to acquire theoretical and practical knowledge of the reliability of technical systems (machines). The fundamentals of probability theory and the application of the laws of probability theory to the analysis of technological and technical systems, including in mechanical engineering, in procurement production, are studied. With the help of probabilistic and statistical models, the problems of designing, manufacturing and controlling products are solved. The use of such models in the calculations and research of the accuracy of equipment and technological processes, in the development and selection of statistical methods for quality control of machine-building products.	5	v								v				
20	Construction materials and heat treatments	The purpose of the discipline is to provide theoretical and practical knowledge of the basic properties of structural materials used in mechanical engineering, methods of their heat treatment. The discipline considers: classification of engineering materials, properties and characteristics of materials, methods of studying the structure and composition of materials, the diagram of iron-cementite. The production of cast iron and steel, non-ferrous metal alloys is being studied. The types of heat treatment, modes and recommendations for their use are considered; promising engineering materials.	5			v				v						
21	Metalworking machines	At the study of this discipline students will get general information on the basic types of industrial equipment for making of de-tails, and also taking	5					v								v

		about bases of plan-ning and exploitation of these types of eq-uipment. Students will know the device of machines, machine-tools and automats. Will master approach of the systems at an analy-sis and synthesis of objects of metal-cutting equipment and will get abilities of kinemat-ics analysis, формообразования etc. Metal-cutting machine-tools. Machine-tools for treatment of bodies of rotation. Machine-tools for treatment of openings. Machine-tools for treatment of prismatic details. Machine-tools for abrasive treat-ment. Metal-cutting machine-tools with CHPU.														
22	Cutting theory	The purpose of the discipline is the formation of knowledge on the basics of the theory of metal cutting, practical skills in calculating cutting modes, choosing a model of equipment. Basic concepts and definitions of cutting theory. The physical basis of the theory of cutting. Performance and failure of blade cutting tools. The peculiarity of various methods of machining. Lubricating technology media. Machinability of various materials. The method of increasing the reliability of the right choice of tool material. Heat phenomena during cutting. The theory of abrasive processing. Calculation of cutting modes. Physico-chemical processing methods. Features of the cutting process and cutting conditions in automated production.	5								v				v
23	Computer-aided engineering systems	The purpose of the discipline is to form theoretical and practical knowledge of the principles of building computer-aided design systems (CAD- Computer aided design), their classification, methods for formalizing the design and construction process, methods of using information technologies to automate design and engineering work. The structure and principles of the organization of the computer-aided design process, composite components and software tools of CAD systems are studied. Operation of geometric modeling methods, computer analysis of built models.	5									v			v
24	Bases of designing and details of cars	Purpose: to acquire knowledge of calculations and design of machine parts and assemblies, taking into account the criteria of strength, reliability and stability.Contents_ general principles of design and construction, construction of models and calculation algorithms for standard machine parts taking into account performance criteria, fundamentals of theory and methodology for calculating standard machine parts, computer technologies for designing assemblies and machine parts. Basic requirements for machine parts and assemblies_	5			v			v							
25	Automation of process design and calculation	The purpose of this discipline is to acquaint students with the automation of technological design and production preparation, the creation of control programs for CNC machines, the principles of development of such programs and the role of Postprocessors. The objectives are the study of the following aspects: practical training in working with CAM systems, assignment of technological operations and tools for the manufacture of products in the CAM system, modeling the processing of products and checking the correctness of written control programs both in the CAM system and on the CNC machine control rack.	5									v			v
26	Mechanics of liquid and gas	The course "Mechanics of liquid and gas" examines the models and physical properties of liquids and gases; the forces acting in the fluid, hydrostatic pressure and its properties; basic equations and laws of equilibrium and	5											v	

		motion of liquids and gases; flow regimes and methods for calculating applied problems													
27	Occupational health and industrial safety (by industry)	Purpose: formation of knowledge, skills and abilities of students on the occupational health and safety management system at enterprises, taking into account industry specifics. Contents: regulatory and legal framework for occupational safety; harmful production factors; accidents and occupational diseases at work; industrial sanitation and occupational health; regulatory and technical regulation in the field of industrial safety; measures to protect employees at the enterprise	5			v									
Cycle of basic disciplines Optional component															
28	Hydraulics and hydraulic pneumatic drive	The purpose of the discipline is the formation of knowledge in the field of hydraulics, hydraulic and pneumatic machines for processing, feeding and moving liquids and gases. The discipline deals with the issues of hydrostatics: basic physical properties of liquids and gases; hydrodynamics: motion of liquids and gases, Euler and Bernoulli equations, modeling of hydrodynamic phenomena; hydraulic machines and hydraulic drives. Fundamentals of pneumatic actuators, pneumatic motors, equipment of pneumatic systems. The basics of operation of combined hydraulic pneumatic actuators are studied.	5											v	
29	29Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5			v									
30	30Calculation and design of cutting tools	This discipline must teach students correct-ly to construct and rationally exploit mod-ern metal-cutting instruments. To teach stu-dents correctly to design, and also gro-unded to choose from a set of standard, necessary metal-cutting instruments, com-ing from the set requirements to quality of details and terms of their treatment. Inst-rumental materials. Instruments for treat-ment of openings. Abrasive instruments. Instruments for formation of screw-thread. Instruments for treatment of not эволь-вентных types.	5					v			v				
31	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5			v									
Cycle of profile disciplines															

University component																
32	Technology of production of machines	The purpose of the discipline is to acquire theoretical and practical knowledge of the methodology of designing technological processes for the production of machines. The discipline studies the basics of mechanical engineering technology, the theory of basing workpieces during processing, the theory and calculation of allowances, processing modes, rationing of the technological process of assembling machines. Typical technological processes of manufacturing machine parts, assembly of assemblies and machines; quality control methods are studied.	5					v			v					
33	Processes of machine-building production	The purpose of the discipline is to acquire knowledge of technological methods for obtaining and processing blanks and machine parts. The discipline studies the general characteristics of metals and alloys used in mechanical engineering, the technological foundations of metallurgical production, the technology of metal processing by pressure, the technology of foundry production, the technology of welding production. The technology of production of blanks and machine parts from non-metallic materials is considered; features of welding of various metals and alloys.	5					v		v						v
34	Statistical methods in industrial engineering	The concept of selective statistical research. General and selective set. Absolute and relative statistics. Definition of an index as a statistical indicator. Economic substantiation of scales. Laspeyres and Paasche indices. Interrelation of indices. Justification of the choice of weights in territorial indices. Tasks and system of indicators of price statistics. Consumer price indices and producer prices. Statistics of production costs. Grouping the cost of production by economic elements and costing items.	5					v			v					
35	Robotization of machine-building production	The purpose of the discipline is to prepare a future specialist for design and technological activities in the conditions of production automation based on industrial robots. The basics of automation and robotization of mechanical engineering, the structure and technological capabilities of robots are studied. Classification of robots, principles of operation of gripping devices, features of robots used in machine assembly operations. The main technical parameters of robots, cyclograms of work in flexible production models.	6								v	v				
36	Design of machining on CNC machines	The purpose of the discipline is theoretical and practical knowledge on the design of technological processes for processing workpieces on CNC machines. The discipline studies the issues of classification, the structure of CNC machines, the development of control programs. Design of processing technology on turning, grinding, milling, combined CNC machines. Features of designing technological processes in the conditions of flexible automated production, programming automation systems.	5					v				v				
37	Organization and planning of machine-building production	The purpose of the discipline is the formation of practical skills in the design of production sites and workshops. The main stages of designing mechanical assembly shops with calculation of the main technological and production parameters, classification of mechanical shops and their composition, lifting and transport equipment of the shop and warehousing are considered. The structure of workshops, the layout of the main and auxiliary production sites.	6									v	v			

		Calculations of the quantity and productivity of equipment, the capacity of production and technological equipment.														
Cycle of profile disciplines Optional component																
37	Innovative technologies in mechanical engineering	The purpose of the discipline is to acquire theoretical and practical knowledge and skills in the field of innovative technologies in mechanical engineering, technological processes of repair and restoration of worn parts and machine components. The discipline examines innovative technologies in mechanical engineering, including modern methods of obtaining blanks by casting, pressure treatment, powder metallurgy and cutting, processing methods, designs of metal-cutting machines, tools for the manufacture of complex parts, methodological foundations for the construction of modern technological processes of mechanical processing and assembly of machine-building products.	5									v				v
38	Additive Manufacturing	The purpose of the discipline is to acquire theoretical and practical knowledge and skills in the field of innovative technologies in mechanical engineering, technological processes of repair and restoration of worn parts and machine components. The discipline examines innovative technologies in mechanical engineering, including modern methods of obtaining blanks by casting, pressure treatment, powder metallurgy and cutting, processing methods, designs of metal-cutting machines, tools for the manufacture of complex parts, methodological foundations for the construction of modern technological processes of mechanical processing and assembly of machine-building products.	5													v
39	Design and calculation of technological equipment	Students acquire theoretical knowledge and practical skills of designing of the industrial equipment applied at processing of details of cars. Role and value of industrial equip-ment in mechanical engineering develop-ment. Classification of adaptations: on a special-purpose designation, a technological sign, specialisation and mechanisation de-gree. Basic elements of designs. Special ad-aptations. Designing and calculation of ad-aptations. Calculation and a choice of drives for adaptations.	5					v			v					
40	Progressive methods of surface treatment	The purpose of the discipline is to acquire knowledge of modern methods of surface treatment of workpieces in machine-building production. The discipline considers technologies of procurement production - laser and waterjet cutting of metal; new structural materials - processing of metal-carbon fiber packages. Electrophysical and electrochemical methods of surface treatment of workpieces. Innovative technologies are considered - additive manufacturing, manufacturing of parts on 3D printers. Finishing and strengthening methods of processing parts.	5								v					v
41	Theory and practice of project management	The purpose of mastering the discipline is to expand and deepen knowledge about modern project management technology and study the principles of using project management in practical tasks. Mastering the discipline involves an introduction to the problems of project management and the study of project management methodology, familiarization with the tools and methods of project management at all stages of the project life cycle, starting with	5					v			v		v			

		initialization project, planning its work, organizing their use and control, and ending with completion.														
42	Capstone Project	The purpose of the discipline is the formation of a complex of theoretical knowledge and practical skills in management, maintenance and support of technical preparation of production. Practical possibilities are considered and professional skills of students to work in a team are formed. Students solve real engineering and technical problems of production, formation and implementation of the life cycle of machine-building products based on the collection of information, critical assessment of the feasibility of the project, in-depth analysis and execution of the project report.	5									v	v		

5. Curriculum of the educational program

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of Kaztu named after K.Satpayev
M.M.Begentaev
2024 y.

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 6B07105- "Industrial engineering"
Group of Educational programs B064 - "Mechanics and metalworking"

Form of study: full-time **Duration of study: 4 years** **Academic degree: Bachelor of Engineering and Technology**

Discipline code	Name of disciplines	Cycle	Total amount in credits	ECTS credits	ABET credits	Total hours	classroom volume of lek/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
										I course		II course		III course		IV course	
										1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG 108	English language	GED, RC	5	5	3	150	0/0/3	105	E	5							
LNG 108	English language	GED, RC	5	5	3	150	0/0/3	105	E		5						
LNG 104	Kazakh (Russian) language	GED, RC	5	5	3	150	0/0/3	105	E	5							
LNG 104	Kazakh (Russian) language	GED, RC	5	5	3	150	0/0/3	105	E		5						
M-2. Module of physical training																	
KFK 101-104	Physical Culture	GED, RC	8	8	8	240	0/0/8	120	Difcredit	2	2	2	2				
M-3. Module of information technology																	
CSE 677	Information and communication technologies	GED, RC	5	5	3	150	2/1/0	105	E				5				
M-4. Module of socio-cultural development																	
HUM 137	History of Kazakhstan	GED, RC	5	5	3	150	1/0/2	105	SE		5						
HUM 132	Philosophy	GED, RC	5	5	3	150	1/0/2	105	E				5				
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	3	3	90	1/0/1	60	E				3				
HUM 134	Socio-political knowledge module (culturology,	GED, RC	5	5	3	150	2/0/1	150	E			5					
M-5. Module of anti-corruption culture, ecology and life safety base																	
MSM500	Fundamentals of scientific research methods	GED, CCH	5	5	3	150	2/0/1	150	E			5					
MNG 489	Fundamentals of Economics and Entrepreneurship																
HUM 136	Fundamentals of Anti-corruption Culture and Law																
CHE 656	Ecology and life safety																
MNG564	Basics of Financial Literacy																
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT 101	Mathematics I	BD, UC	5	5	3	150	1/0/2	105	E	5							
PHY 111	Physics I	BD, UC	5	5	3	150	1/1/1	105	E	5							
MAT 102	Mathematics II	BD, UC	5	5	3	150	1/0/2	105	E		5						
PHY112	Физика II	БД, ВК	5	5	3	150	1/1/1	105			5						
M-7. General technical training module																	
MSM132	Introduction to engineering desig	BD, UC	5	5	3	150	1/2/0	105	E	5							
GEN 147	The theory of mechanisms and machines	BD, UC	5	5	3	150	1/1/1	105	E					5			
CHE 815	General Chemistry	BD, UC	4	4	3	120	1/1/1	75	E	4							
MSM464	Computer-aided engineering systems	BD, UC	5	5	3	150	0/3/0	105	E			5					
GEN412	Theoretical mechanics	BD, UC	5	5	3	150	2/0/1	105	E			5					
MSM102	Basics of interchangeability	BD, UC	5	5	3	150	1/1/1	105	E					5			
MSM133	Structural materials and heat treatment	BD, UC	5	5	3	150	1/2/0	105	E			5					
ELC101	Electrical engineering and electronics	BD, UC	5	5	3	150	1/1/1	105	E			5					
GEN408	Resistance of materials	BD, UC	5	5	3	150	1/1/1	120	E				5				
MSM106	Probabilistic models in industrial engineering	BD, UC	5	5	3	150	1/2/0	105	E				5				
MSM101	Cutting theory	BD, UC	5	5	3	150	1/1/1	120	E					5			
GEN125	Bases of designing and details of cars	BD, UC	5	5	3	150	1/1/1	120	E					5			
MCH531	Qualimetry in mechanical engineering	BD, UC	5	5	3	150	2/0/1	105	E					5			
MSM401	Metalworking machines	BD, UC	5	5	3	150	1/0/2	105	E					5			
MSM419	Economics of a machine-building enterprise	BD, UC	5	5	3	150	1/0/2	105	E							5	
MSM466	Automation of process design and calculation	BD, UC	5	5	3	150	1/0/2	105	E						5		
GEN119	Mechanics of liquid and gas	BD, UC	5	5	3	150	1/1/1	120	E						5		
Elective disciplines of the BD																	

MSM150	Calculation and design of cutting tools	BD, CCH	5	5	3	150	1/0/2	105	E						5		
CSE831	Fundamentals of Artificial Intelligence																
MSM149	Hydraulics and hydropneumatic drive	BD, CCH	5	5	3	150	1/0/2	105	E						5		
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan						2/0/1										
AAP196	Training Practice	BD, UC	2	2	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-8. Module of production and technological preparation																	
HYD482	Labor protection and industrial safety (by industry)	BD, UC	5	5	3	150	2/0/1	105	E							5	
MSM176	Technology of mechanical engineering	PD, UC	5	5	3	150	1/0/2	105	E							5	
MSM129	Technological processes of machine-building production	PD, UC	5	5	3	150	2/1/0	105	E						5		
MSM114	Statistical methods in industrial engineering	PD, UC	5	5	3	150	1/1/1	105	E							5	
MSM430	Robotization of machine-building production	PD, UC	6	6	4	180	2/1/1	120	E							6	
MSM426	Design of machining on CNC machines	PD, UC	5	5	3	150	1/0/2	105	E								5
MSM457	Organization and planning of machine-building production	PD, UC	6	6	4	180	2/0/2	120	E							6	
Elective disciplines of the PD																	
MSM192	Renovation technologies in Mechanical Engineering	PD, CCH	5	5	3	150	1/0/2	105	E								5
MSM119	Additive manufacturing						2/0/1										
MSM159	Design and calculation of technological equipment	PD, CCH	5	5	3	150	1/0/2	105	E								5
MSM431	Progressive methods of surface treatment						1/2/0										
AAP408	Industrial practice I	PD, UC	3		3								3				
AAP176	Industrial practice II	PD, UC	5		5										5		
M-9. Management training module (Elective R&D)																	
MNG481	Theory and practice of project management	PD, CCH	5	5	3	150	2/0/1	105	E								5
MSM418	Capstone Project						1/2/0										
M-10. Module of final attestation																	
ECA109	Writing and defending a thesis (project)	FE	8	8	8												8
M-11. Module of additional types of training																	
AAP500	Military affairs	ATT	0														
Total based on UNIVERSITY:										31	29	32	28	30	30	32	28
										60		60		60		60	

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		required component (RC)	university component (UC)	component of choice (CCH)	Total
GED	Cycle of general education disciplines	51		5	56
BD	Cycle of basic disciplines		111	10	121
PD	Cycle of profile disciplines		40	15	55
	Total for theoretical training:	*51*	*151*	*30*	*232*
FA	Final attestation	8			8
	TOTAL:	59	151	30	240

Decision of the Academic Council of Kaznu named after K.Satpayev. Protocol № __от "____" _____20___ y.

Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № __от "____" _____20___ y.

Decision of the Academic Council of the Institute E&ME. Protocol № __от "____" _____20___ y.

Board Member -Vice-Rector for Academic Affairs R.Uskenbaeva

E&ME Institute Director K.Yelemessov

ME Department Head E.Nugman

Specialty Council representative from employers I. Dyusebaev