A. Burkitbayev Institute of Power and Mechanical Engineering

Department of «Mechanical engineering»

EDUCATIONAL PROGRAM

6B07105- Industrial engineering

(code and name of educational program)

Code and classification of the field of education:
6B07-Engineering, manufacturing and consruction industries
Code and classification of training directions:
6B071-Engineering and engineering affairs
Group of educational programs:
B064-Mechanics and metal working
Level based on NQF: 6
Level based on IQF: 6
Study period: 4 years
Amount of credits: 240

Almaty 2025

Educational program **6B07105 - Industrial engineering**
(code and name of educational program)
was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes 10 dated « 06 » 03 2025.

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

Minutes 3 dated « 20 » 12 2024.

Educational program 6B07105- Industrial engineering
(code and name of educational program)
was developed by Academic committee on direction "6B071- Engineering and Technology "

Full name	Academic degree/ academic title	Position	Workplace	Signature
Teaching staff:				
Nugman E.Z.	Doctor PhD, Associate Professor	Head of the Department of "Mechanical Engineering"	Institute of Energy and Mechanical Engineering named after A.Burkitbaev	
Kerimzhanova M.F.	Candidate of Technical Sciences, Docent	Professor	Department of Mechanical Engineering	
Uderbayeva A.E.	Doctor PhD	Assoc. Professor	Department of Mechanical Engineering	
Employers:				
Andreev V.I.		General Director	Kazecotech STE LLP	
Students				
Myrzakhan A.		1st year doctoral student	Department of "Mechanical Engineering"	

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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
SDGs	Sustainable development goals

1 Description of the 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 Purpose and objectives of the educational program

Purpose of EP:

The purpose of the educational program is the professional training of highly qualified specialists focused on the design and implementation of innovative and effective engineering technologies that promote sustainable development, the formation of a technically literate, socially responsible and environmentally oriented personality with creative thinking, capable of responding to the challenges of modern industry.

Tasks of EP:

- 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 educational program learning outcomes

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

№	Field name	Comments
1	Code and name field of education	6B07- Engineering, manufacturing and construction industries
2	Code and classification direction of personnel training	6B071- Engineering and engineering affairs
3	Educational program group	B064- Mechanics and metal working
4	Educational program name	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	Purpose of EP	The purpose of the educational program is the professional training of highly qualified specialists focused on the design and implementation of innovative and effective engineering technologies that promote sustainable development, the formation of a technically literate, socially responsible and environmentally oriented personality with creative thinking, capable of responding to the challenges of modern industry.
7	Type of EP	New
8	The level based on NQF	6
9	The level based on IQF	6
10	Distinctive features of EP	-
11	List of competencies of 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 educational program	LO1 Analyze, synthesize and design elements of machine structures using modern materials and methods for calculating structures for strength, rigidity and stability. LO 2 To carry out technical preparation of production, to evaluate the quality of production processes and engineering products. LO 3 To carry out technical preparation of production, to evaluate the quality of

		production processes and engineering products LO 4 Use process modeling methods, software products and the latest technologies to solve engineering problems in the field of metalworking. LO 5 Apply basic knowledge of fundamental disciplines of mathematics, physics, chemistry, digital technologies in the design and preparation of machine-building production. LO 6 To apply knowledge of economic laws, occupational safety and health, ecology, rules of moral development, culture of academic integrity, take into account the social and ethical aspects of inclusion. LO 7 Analyze and apply modern methods of economic regulation and production management, planning and organization of production. LO 8 Apply the principles of interchangeability and rationing of standard connections in machines. LO 9 The use of modern technical means and information technologies of machine-building production, advanced equipment, tooling and additive technologies. LO 10 To design equipment and tools based on the principles of sustainable development and inclusive engineering.. LO 11 To use the laws of fluid and gas mechanics in the design and operation of technological equipment for the manufacture of machine-building products, taking into account innovative technologies, ensuring reliability, safety and minimizing environmental impact. LO 12 Apply modern engineering materials, technologies and methods of design and production of blanks in mechanical engineering, taking into account the principles of resource conservation, environmental safety and responsible production.
13	Education form	full-time
14	Period of training	4 years
15	Amount of credits	240
16	Languages of instruction	Kazakh, russian

17	Academic degree awarded	Bachelor of Engineering and technology
18	Developer(s) and authors	The educational program was developed by Academic committee on direction "6B071- Engineering and Technology "

4.2 Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning 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	5					v							

		industrial experiment, bench research. The discipline introduces the basics of the theory of solving inventive problems, algorithmic methods of finding 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	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							
7	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							
8	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							
9	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 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.	5				v	v							

10	Introduction to engineering design	The purpose of the discipline is to acquire practical knowledge of engineering design methodology. The stages of creating machines. Design procedures. Basic principles of engineering design. Methods of engineering design. Manufacturability of machine designs. Economic aspects of engineering design. Problems of design, ergonomics and ecology in engineering design Optimization of design solutions. Methods for solving optimal engineering design problems. The basic concepts of reliability theory. Disadvantages of traditional engineering design. Goals and objectives of engineering design. Engineering design systems.	5	V					V						
11	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							
12	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
13	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						
14	Production workshops	The purpose of the discipline is to form knowledge about the technological processes of manufacturing machine parts and practical knowledge of metalworking. The workshops study the locksmith's workplace, locksmith and cutting tools, tool materials, work on universal metal-cutting machines (turning, drilling, milling and grinding). Familiarity with the purpose and classification of machines. Machining of workpieces on sheet bending machines, laser machine with numerical control, milling machining center.	5		V			V							
15	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 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	5						V	V					

		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.														
16	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
17	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			v				
18	Automated engineering calculation	The purpose of the discipline is to study the role and significance of computer analysis of products using finite element modeling, mastering the methods of performing product designs using CAE-Computer-Aided Engineering, an engineering analysis system. Application of modern software and computer equipment for design - Solidworks, Ansys, Nastran, etc. Functionality of CAE systems; Typical product analysis tasks principles of numerical methods of engineering analysis; standard software for calculating machine parts. Stages of working with CAE.	5				v				v				
19	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
20	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 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-	5									v	v			

		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.														
21	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		
22	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			
23	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							
24	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								
25	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	5						V			V			

		sanitation and occupational health; regulatory and technical regulation in the field of industrial safety; measures to protect employees at the enterprise													
Cycle of basic disciplines Optional component															
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 motion of liquids and gases; flow regimes and methods for calculating applied problems	5					v						v	
27	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		v	
28	Fundamentals 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	v					
29	Calculation 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		
30	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							
31	Inclusive engineering technologies	The purpose of the discipline is to develop future engineers' competencies in the development, design and implementation of technical solutions that take into account the principles of inclusive engineering and accessibility. The discipline includes the study of the fundamentals of inclusive engineering:	5						v				v		

		universal design and accessibility of engineering solutions, ethical and social aspects of inclusive engineering. Design of technical solutions with inclusion in mind, implementation of VR/AR simulations for modeling inclusive engineering systems. Students will acquire skills in applying modern technologies to create affordable solutions.													
32	Test and Measurement, Measurements and Statistics	The purpose of the discipline is to master the principles, methods and means of measurement, as well as the skills of statistical processing of results. Students gain knowledge about metrological fundamentals, quality control methods, and data analysis. They study control and measuring devices, methods and measuring instruments. Principles of operation of measuring instruments, calibration and verification of instruments. Quality control and process management, methods of statistical quality control, optimization and use of control maps and rationing. They acquire practical skills in the use of control and measuring instruments, quality analysis and measurement process management.	5		v						v	v			
33	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	5						v	v					
		Cycle of profile disciplines University component													
34	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								
35	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		
36	Engineering Product Lifecycle Management	The purpose of the discipline is to generate knowledge in the field of automation of industrial product life cycle management, basic methods and technologies of life cycle management systems. Practical skills are acquired in automated systems of technical preparation of production and management, automated systems of enterprise management (PDM- product data management, PLM-Product Lifecycle Management), their individual	5							v		v			

		subsystems, optimization of management according to the criterion of economic efficiency and high competitiveness of products, organization of a single information space about the product.													
Cycle of profile disciplines Optional component															
37	Technology and equipment of welding production	Purpose of study: to give an idea to students about welding technology, types, structure and principle of operation of modern welding technology The student will be able to determine the type of a well-known welding machine, welding modes. To prepare and configure the device to perform the welding operations.	5				v					v			
38	Composite materials processing technology	The purpose of the discipline is to study and analyze the use of composite materials for the manufacture of high-quality machine parts and economic indicators of manufacturing. The discipline studies the structure and properties of composite materials, the properties of matrix materials. The development of special equipment, the creation of the required energy state of the processed material, the use of combined energy effects that ensure high economic performance of products made of composite materials are studied.	5	v											v
39	Production design	The purpose of the discipline is to prepare the student to solve problems related to the design of workshops, the ability to find and choose progressive design and technological solutions. The composition of the machine-building plant. Determination of the quantity and loading of equipment. Selection of the type and calculation of heating devices. Calculation of the number of workers. Determination of the areas of departments within the workshop. The layout of the main and auxiliary sections, the transport system of the workshop. Design methods. Classification and structure of the main workshops. Construction design. Automation of design of workshops of machine-building plants	6			v						v			
40	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. Calculations of the quantity and productivity of equipment, the capacity of production and technological equipment.	6		v					v					
41	Development of control programs	The purpose of the discipline is theoretical and practical knowledge on the development of control programs for processing on CNC machines. The issues of preparation for the development of control programs, technological documentation, calculation of elements of the trajectory of the cutting tool, recording, control and editing of the control program are considered. The basic principles of automation of the process of preparation of control programs. The study of the automated workplace of a programmer technologist, a CNC machine operator. Various software products of SolidWorks, Autodesk are considered.	5				v					v			
42	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	5									v	v		

		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.														
43	Automation of technological processes in mechanical engineering	The purpose of the discipline is the formation of comprehensive knowledge about modern approaches to production automation, the acquisition of skills in designing infrastructure for automated production; knowledge necessary for the design of innovative production processes. Basic concepts and goals of automation. Sustainability of automated production. CAD/CAM/PLM, digital factory. Robotics and flexible systems. Industrialization, infrastructure development. Practical skills in developing an automated production line, analyzing examples of modern "smart factories" in mechanical engineering.	6				v									v
44	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				
45	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		
46	CAM(Solidworks, Inventor)	The purpose of teaching the discipline is to form the skills of the profession as a constructor using the Solid Works program. The purpose of the discipline is to form students ' basic concepts of modeling(structure, classification,application of models, requirements for models), to introduce students to the theoretical foundations and ways of optimization of modeling processes in Mechanical Engineering, processing and obtaining information from various sources, to analyze the structure of the model, to know its application ,to know the methods of constructing models, to use modern applied programs in the design of machine mechanisms and nodes.Machines, drives, and systems being studied, development of physical and mathematical models of phenomena and objects	5			v						v				
47	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	5									v	v			

		ad-aptations. Designing and calculation of ad-aptations. Calculation and a choice of drives for adaptations.														
48	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
49	Project management in mechanical engineering	The purpose of the discipline is to acquire knowledge of methodology and project management in mechanical engineering, organization, enterprise design and product development. The discipline studies the basics of project management, Scrum Factory tools and methods, Scrum Factory implementation in organizations; methods of analysis and planning of machine-building production indicators based on a qualimetric approach, evaluating the effectiveness of projects and personnel management, planning team work for the future.	5							v						v
50	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

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year: 2025-2026 (Autumn, Spring)
Group of educational programs: B064 - "Mechanics and metal working"
Educational program: 6B07105 - "Industrial engineering"
The awarded academic degree: Bachelor of engineering and technology
Form and duration of study: full time - 4 years

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites
									1 course		2 course		3 course		4 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5								
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5							
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5							
M2 Module of physical training																	
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2								
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2							
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2					
M3 Module of information technology																	
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E				5					
M4 Module of socio-cultural development																	
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE	5								
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E			5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E			3						
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E				5					
M5 Module fundamentals of anti-corruption culture, ecology and life safety																	
MSM500	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E			5						
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E			5						
HUM136	Fundamentals of anti-corruption culture and law	1	GED, CCH	5	150	30/0/15	105	E			5						
CHE656	Ecology and life safety	1	GED, CCH	5	150	30/0/15	105	E			5						
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E			5						
CYCLE OF BASIC DISCIPLINES (BD)																	
M6 Module of physical and mathematical training																	
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5								
PHY111	Physics I		BD, UC	5	150	15/15/15	105	E	5								
MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5							MAT101

PHY112	Physics II		BD, UC	5	150	15/15/15	105	E		5							PHY111
M7 General technical training module																	
MSM132	Introduction to engineering design		BD, UC	5	150	15/30/0	105	E	5								
ISO111	Production workshops		BD, UC	5	150	0/0/45	105	E		5							
AAP419	Educational practice		BD, UC	1				R		1							
MSM464	Computer-aided engineering systems		BD, UC	5	150	0/45/0	105	E			5						
GEN412	The theoretical mechanics		BD, UC	5	150	30/0/15	105	E			5						
ELC101	Electrical and Electronic Engineering		BD, UC	5	150	15/15/15	105	E			5						
GEN408	Strength of materials		BD, UC	5	150	15/15/15	105	E				5					
GEN125	Bases of designing and details of cars		BD, UC	5	150	15/15/15	105	E				5					
MSM133	Construction materials and heat treatments		BD, UC	5	150	15/30/0	105	E				5					
MSM102	Basics of interchangeability		BD, UC	5	150	15/15/15	105	E					5				
MSM465	Automated engineering calculation		BD, UC	5	150	15/30/0	105	E					5				
MSM101	Theory of cutting		BD, UC	5	150	15/15/15	105	E					5				
MCH531	Qualimetry in mechanical engineering		BD, UC	5	150	30/0/15	105	E					5				
MSM401	Metalworking machines		BD, UC	5	150	15/0/30	105	E					5				
MSM466	Automation of process design and calculation		BD, UC	5	150	15/0/30	105	E						5			
MSM150	Calculation and design of cutting tools	1	BD, CCH	5	150	15/0/30	105	E						5			
CSE831	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	15/0/30	105	E						5			
MCH533	Inclusive engineering technologies	1	BD, CCH	5	150	30/0/15	105	E						5			
MSM108	Test and Measurement, Measurements and Statistics	2	BD, CCH	5	150	15/0/30	105	E						5			
MNG562	Legal regulation of intellectual property	2	BD, CCH	5	150	30/0/15	105	E						5			
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	2	BD, CCH	5	150	30/0/15	105	E						5			
MSM149	Hydraulics and hydraulic pneumatic drive	3	BD, CCH	5	150	15/0/30	105	E						5			
GEN119	Mechanics of liquid and gas	3	BD, CCH	5	150	15/15/15	105	E						5			GEN115, MAT127
MSM419	Economics of a machine-building enterprise		BD, UC	5	150	15/0/30	105	E							5		
M8 The module of production and technological training																	
HYD482	Occupational health and industrial safety (by industry)		BD, UC	5	150	30/0/15	105	E							5		
CYCLE OF PROFILE DISCIPLINES (PD)																	
M8 The module of production and technological training																	
AAP420	Industrial practice I		PD, UC	3				R				3					
MSM159	Design and calculation of technological equipment	1	PD, CCH	5	150	15/0/30	105	E					5				
MSM431	Progressive methods of surface treatment	1	PD, CCH	5	150	15/30/0	105	E					5				
AAP421	Industrial practice II		PD, UC	5				R						5			
MSM129	Processes of machine-building production		PD, UC	5	150	30/15/0	105	E						5			
MSM176	Technology of production of machines		PD, UC	5	150	15/0/30	105	E							5		
MSM192	Innovative technologies in mechanical engineering	1	PD, CCH	5	150	15/0/30	105	E							5		
MCH149	CAM(Solidworks, Inventor)	1	PD, CCH	5	150	15/30/0	105	E							5		
MSM457	Organization and planning of machine-building production	2	PD, CCH	6	180	30/0/30	120	E							6		
MSM421	Production design	2	PD, CCH	6	180	30/0/30	120	E							6		
MSM412	Composite materials processing technology	3	PD, CCH	5	150	15/30/0	105	E							5		
TEC146	Technology and equipment of welding production	3	PD, CCH	5	150	30/15/0	105	E							5		PHY112
MSM467	Engineering Product Lifecycle Management		PD, UC	5	150	15/0/30	105	E								5	
MSM429	Automation of technological processes in mechanical engineering	1	PD, CCH	6	180	30/15/15	120	E								6	
MSM430	Robotization of machine-building production	1	PD, CCH	6	180	30/15/15	120	E								6	
MSM426	Design of machining on CNC machines	2	PD, CCH	5	150	15/0/30	105	E								5	

MSM428	Development of control programs	2	PD, CCH	5	150	15/30/0	105	E							5	
M9 «R&D»Management training Module																
MSM418	Capstone Project	1	PD, CCH	5	150	15/30/0	105	E							5	
MSM417	Project management in mechanical engineering	1	PD, CCH	5	150	15/0/30	105	E							5	
M10 The module of final certification																
ECA103	Final examination		FA	8											8	
Additional type of training (ATT)																
AAP500	Military training															
Total based on UNIVERSITY:									32	28	30	30	30	30	31	29
									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	0	5	56
BD	Cycle of basic disciplines	0	101	15	116
PD	Cycle of profile disciplines	0	23	37	60
Total for theoretical training:		51	124	57	232
FA	Final attestation				8
TOTAL:					240

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 3 dated 19.12.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs	Uskenbayeva R. K.
Approved:	
Vice Provost on academic development	Kalpeyeva Z. B.
Head of Department - Department of Educational Program Management and Academic-Methodological Work	Zhumagaliyeva A. S.
Director of the Institute - A.Burkitbaev Institute of Energy and Mechanical Engineering	Yelemesov K. .
Department Chair - Mechanical Engineering	Nugman E. .
Representative of the Academic Committee from Employers ___Acknowledged___	Andreev V. I.