

The list of academic disciplines of the university component

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

6B071 - Engineering and Engineering affairs
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

B064 - Mechanics and metal working
(Code and classification of the educational program group)

6B07108 - Digital technologies in mechanical engineering
(Code and name of the educational program)

bachelor
(Level of preparation)

set of 2024

Developed

By the Academic Committee of the OP
The head of the AK
OP Manager Shayakhmetova Aigerim

Reviewed

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Protocol No. 3 of January 15, 2024
at a meeting of the Commission on Academic Quality of the Higher School of Artificial Intelligence and
construction
Recommended for approval by the University Academic Council
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Approved

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at a meeting of the University Academic Council by protocol No. 11 of June 28, 2024.

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti-corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline

It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students' basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Learning outcomes by discipline

- 1) Analyzes the issues of safety and preservation of the natural environment as the most important priorities of life;*
- 2) Shows knowledge of the basics of environmental management and sustainable development, assesses the impact of man-made systems on the environment;*
- 3) Shows knowledge of the main regulatory legal acts of the Republic of Kazakhstan, their understanding and application;*
- 4) Demonstrates knowledge of the laws of the development of economic processes, clearly formulates his own position, finds and clearly sets out arguments in its defense;*
- 5) Is able to characterize the types of entrepreneurial activity and the entrepreneurial environment, draw up a business plan, create an entrepreneurial structure and organize its activities;*
- 6) Knows the fundamental provisions about the role of leadership in managing large and small social groups.*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Introduction to Digital Engineering

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline

This course examines the history of engineering, its role in the modern culture of creating machines; modern engineering production, the place and role of the scientific approach and invention in it; digital design and construction, its role in the development of digital production; the contribution of scientists to the formation of the mechanical engineering industry; prospects for digital engineering in mechanical engineering, its role at the current stage of development of mechanical engineering. The course is focused on developing knowledge about the digitalization of modern engineering production, the concept of reverse engineering, and modern software.

Purpose of studying of the discipline

provide student orientation in the specifics of this Educational program; give an idea of the main directions and development paths of modern technology and technologies in the field of mechanical engineering and materials processing, digital design and construction.

Discipline learning results

Learning Outcomes

ON3 To use SS, USDD when making working drawings of parts, using modern software

Learning outcomes by discipline

- 1) the use of computer technologies for modeling, analysis and optimization of the processes of design, production and operation of products and systems*
- 2) to improve the efficiency, quality and speed of product development, production and operation*
- 3) creating complex, functional parts with less cost*

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Mathematics

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The purpose of this course is to provide students with fundamental training in mathematics. The course is aimed at forming a sufficiently

high culture of mathematical thinking among students and developing the ability to creatively approach problem solving. In addition to studying the fundamental foundations of higher mathematics (elements of analytical geometry, linear algebra, mathematical analysis, differential equations), the course assumes consideration of various applications of mathematics to solving production problems from the field of professional specialization.

Purpose of studying of the discipline

Creation of the basis for the development of logical thinking and mathematical culture. Formation of basic knowledge and acquisition of basic skills of using mathematical apparatus for solving theoretical and applied problems, as well as the necessary level of mathematical training for mastering other applied disciplines studied within a specific profile; skills of working with special mathematical literature

Learning Outcomes

ON2 Own the skills of applying physical and mathematical knowledge, basic laws of natural science

Learning outcomes by discipline

- 4) Selects methods of mathematical analysis and modeling, theoretical and experimental research of applied problems
- 5) Uses mathematical symbolism to express quantitative and qualitative relations of objects
- 6) Applies methods of visual graphical representation of research result

Prerequisites

School course

Postrequisites

Mathematics

Physics

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline

In process of studying this discipline, students get acquainted with the basic laws, concepts of all sections of physics. Physics is an area of experimental science, performing laboratory work and tasks, students are convinced of unity of the theory and practice of experiments. Students have the opportunity to gain knowledge on the subject in any area of their specialty.

Purpose of studying of the discipline

Formation of ideas about the role of experimental and theoretical methods of cognition of the surrounding world, development of skills for independent solving of physical problems, motivation to study modern scientific literature.

Learning Outcomes

ON2 Own the skills of applying physical and mathematical knowledge, basic laws of natural science

Learning outcomes by discipline

- 1) Assesses the degree of reliability of the results obtained using experimental research methods;
- 2) Uses various physical concepts, laws, theories in practice;
- 3) Applies knowledge of the basic laws of physics in solving professional problems.

Prerequisites

School course

Postrequisites

Theoretical mechanics Interchangeability basics

Training practice

Discipline cycle	Basic disciplines
Course	1
Credits count	2
Knowledge control form	Total mark on practice

Short description of discipline

Familiarization with the production; modern equipment of engineering enterprises; the deepening and consolidation of theoretical knowledge obtained at the university with the tool and tooling used; familiarization with the structure of procurement, assembly, mechanical processing and maintenance workshops at the enterprise; transport devices: rail network, track devices, garage for road transport, suspended tracks, lifting and transport devices. Practice is a form of cognitive and practical activity of the student aimed at consolidating and testing the knowledge of the student

Purpose of studying of the discipline

The purpose of educational practice is acquaintance with production; modern equipment of machine-building enterprises; deepening and fixing of the theoretical knowledge gained at the university; acquaintance with structure of the machining enterprises; i.e. practice is a form of cognitive and practical activities of the student directed to fixing and an examination of the student

Learning Outcomes

ON3 To use SS, USDD when making working drawings of parts, using modern software

Learning outcomes by discipline

1. Describe the main equipment of the machine-building enterprise
2. classify production structure
3. Distinguish between the main methods of material processing

Prerequisites

School course

Postrequisites

Production practice I

Construction materials and heat treatment

Discipline cycle	Basic disciplines
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Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course examines the theoretical foundations of materials science, metal corrosion, and the main methods of heat treatment of materials. Metal structural materials are described: steels, cast irons, aluminum, copper and other alloys, as well as corrosion-resistant heat-resistant steels and alloys, tool steels and alloys, steels and alloys with special physical properties, non-metallic materials (rubbers, composite materials, plastics, metal-ceramic materials). The characteristics of the main equipment for heat treatment of materials are given. The course is aimed at developing knowledge and skills for the correct selection of structural materials for machine parts, selection of the type of heat treatment and its optimal modes.

Purpose of studying of the discipline

To teach the student modern progressive methods of producing metals and new structural materials.

To provide knowledge about the structure, physical, mechanical and technological properties of metals and non-metallic materials, and also about the possibility of controlling the properties of materials using heat treatment

Learning Outcomes

ON5 To have the basics of strength calculations, including using modern software systems, selection of harvesting structural materials

ON6 To have the basics of designing and designing parts and assemblies of machine-building structures in accordance with the terms of reference

Learning outcomes by discipline

- 1)improving the mechanical and operational properties of metals and alloys*
- 2) optimize the characteristics of materials and increase their operational reliability*
- 3) withstand various mechanical and operational loads during operation.*

Prerequisites

Mathematics Physics

Postrequisites

Technological processes of machine-building production

Interchangeability basics

Discipline cycle	Basic disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course examines methods for ensuring interchangeability and its methodological foundations in relation to modern products of mechanical engineering and instrument making. Methods for calculating and selecting fits with clearance and interference, calculating dimensional chains and threaded connections, calculating and selecting fits for rolling bearings, methods for selecting fits for keyed connections and calculating the accuracy of gears, as well as recommendations for making working drawings of parts are considered. Examples are given of solving problems of choosing fits with clearance and interference, and standardizing the accuracy of some connections. The course is aimed at developing the ability to make informed choices for given conditions and ensure quality performance of products.

Purpose of studying of the discipline

familiarization of students with methods of ensuring interchangeability and its methodological foundations in relation to modern products of mechanical engineering and instrument making. The study of the discipline will allow future bachelors to provide the necessary level of machine design

Learning Outcomes

ON4 To make an informed choice for the specified conditions and ensure the quality of products

Learning outcomes by discipline

- 1 assign bearing fits, smooth cylindrical, threaded, key, splined joints, gear gears;*
- 2. assign appropriate control methods during the development of the technological process of castings, stamping, forgings*
- 3. analyze the influence of input parameters on the functional indicators of the product and its parts, as well as assign accuracy of input parameters*

Prerequisites

Mathematics Physics

Postrequisites

Fundamentals of design and machine parts

Production practice I

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Total mark on practice

Short description of discipline

Production practice is aimed at consolidating the theoretical knowledge gained at the university; to solve production problems directly in workshops and departments of engineering enterprises, as well as practical study of the forms and methods of organization of production, technological and labor processes adopted at the enterprise in terms of their efficiency; identification of advanced technological methods of machining parts; acquisition of work skills directly at the workplaces of process engineers.

Purpose of studying of the discipline

identification of progressive technological ways of machining of details, as-semblies of knots, units, machines; ac-quisition of labor skills of performance of work directly in workplaces of process engineers. Acquaintance with all complex of technological process of production of cars, economies, organi-zation and planning of production, mastering skills of the independent so-lution of engineering,

economic and administrative problems

Learning Outcomes

ON4 To make an informed choice for the specified conditions and ensure the quality of products

Learning outcomes by discipline

1. Describe the principle of operation of universal and special devices used in machining
2. explain the purpose, design, principle of operation and method of using auxiliary, cutting and measuring tools used in machining
3. analyze the technological process of mechanical processing of the main typical parts on metal-working machines using technological documentation

Prerequisites

Training practice

Postrequisites

Manufacturing practice II

Innovative materials

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline

The course studies the main aspects of replacing traditional materials in mechanical engineering with innovative polymer ones, composite, nanostructured materials; the features of the choice of components for polymer composites are considered materials, methods for predicting the properties of new materials. The course is aimed at developing professional competencies in the field of knowledge of new materials and technologies for their production, as well as developing ideas about nanomaterials and composite materials, methods of their research and areas of application.

Purpose of studying of the discipline

Formation of professional competencies in the field of knowledge of new materials and technologies for their production, as well as the formation of ideas about nanomaterials and composite materials, methods of their research and application.

Learning Outcomes

ON5 To have the basics of strength calculations, including using modern software systems, selection of harvesting structural materials

ON6 To have the basics of designing and designing parts and assemblies of machine-building structures in accordance with the terms of reference

Learning outcomes by discipline

1. study of the classification of materials, their structures and properties, structural features, properties and applications of modern materials and nanomaterials, the basics of designing materials with desired properties,
2. formation of ideas about the technologies for the manufacture and processing of materials, the main methods for studying the composition, structure, physical properties of materials,
3. acquisition of practical skills in research and description of the properties of various groups of materials.

Prerequisites

Construction materials and heat treatment

Postrequisites

Bases of technology of mechanical engineering Key elements of manufacturing preparation in mechanical engineering Basics of machine manufacturing

World of Abai

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiyev, which form worldview and aesthetic values, the student's ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai's heritage, the significance of his works for history, literature and science are determined.

Purpose of studying of the discipline

Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiyev, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

Learning outcomes by discipline

ON 1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technologies taking into account current trends in the development of society.

- 1) Analyzes the philosophical and artistic foundations of works, historical facts related to the creative heritage of Abai Kunanbayev, Shakarim Kudaiberdiyev, Mukhtar Auezov
- 2) Uses in practice the humanistic ideas of Abai's philosophical and artistic works
- 3) Assesses the place and significance of Abai's works in the history of literature and science

Prerequisites

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP

Technological processes of machine-building production

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline

This course discusses the basics of metallurgical production of ferrous and non-ferrous metals; main methods of materials processing (pressure treatment, cutting treatment, welding, soldering), main equipment for materials processing by pressure, welding, soldering, cutting; foundry bases casting equipment and methods of metal forming, welding, casting and cutting; technology of production of blanks and machine parts from non-metallic materials

Purpose of studying of the discipline

Teach the student, future engineer to choose technological methods for obtaining and processing workpieces and parts of machines that ensure high quality of products, saving material, high labor productivity. He must know the main methods of processing materials (by pressure, casting, cutting, welding, soldering)

Learning Outcomes

ON4 To make an informed choice for the specified conditions and ensure the quality of products

Learning outcomes by discipline

- 1. have an idea of the prospects for the development of the foundries, production of workpieces by methods of pressure treatment, welding production and metal processing on metal cutting machines*
- 2. select the technology for manufacturing the workpiece and its mechanical processing depending on the design features of the parts, material and working conditions, determine a rational method of welding structures;*
- 3. describe the essence of the processes of producing metals and alloys, the peculiarities of forming workpieces by various methods, the principles of obtaining permanent joints by welding and soldering, the physical foundations of methods of processing workpieces by cutting products used in mechanical engineering*

Prerequisites

Construction materials and heat treatment

Postrequisites

Bases of technology of mechanical engineering Key elements of manufacturing preparation in mechanical engineering Basics of machine manufacturing

Fundamentals of design and machine parts

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

This course covers mechanical gears (gear, worm, chain, belt, friction, planetary, wave); couplings, rolling and sliding bearings; theoretical basis of design, calculation and design of parts and assemblies of all technological machines, ensures the quality of manufactured products by selecting structural materials of blanks, designs parts and assemblies of machine building structures in accordance with the technical assignment used in various branches of the national economy

Purpose of studying of the discipline

The purpose of this course is to form the bachelor's knowledge and ability to independently solve the calculation and design of general-purpose parts with the implementation of the necessary drawings.

Learning Outcomes

- ON5 To have the basics of strength calculations, including using modern software systems, selection of harvesting structural materials*
ON6 To have the basics of designing and designing parts and assemblies of machine-building structures in accordance with the terms of reference

Learning outcomes by discipline

- 1) Compare machines and mechanisms, structures and methods for calculating the drive, and the main components of the machines.*
- 2) Study the basic concepts and definitions.*
- 3) Apply the knowledge gained to build mathematical models of real processes and phenomena*

Prerequisites

Theoretical mechanics Strength of materials Analytical dynamics and vibration theory Information and communication technology Mechanics of Materials

Postrequisites

Metal-cutting machine tools Machine equipment of tool production Fundamentals of machine design

Manufacturing practice II

Discipline cycle	Basic disciplines
Course	2
Credits count	7
Knowledge control form	Total mark on practice

Short description of discipline

Production practice 2 is aimed at studying the tasks, functions and structure of the service of the chief designer and design bureau; Department of the Chief Technologist and with the work of the Process Engineer; study of the system of design preparation of production; with organization of metrological control of design documentation; with the tasks, functions and structure of the standardization service, with the system of the Unified Design Documentation System, with the occupational health and safety system

Purpose of studying of the discipline

The purpose of practice is similar acquaintance with tasks and content of work of the design engineer. Mastering skills of the

independent solution of engineering, economic and administrative problems, deepening and fixing of the theoretical knowledge gained at the university to the solution of production tasks directly in shops and departments of machine-building enterprises and also practical studying of the forms taken at the enterprise and methods of the organization of production, technological and labor processes in terms of their efficiency; identification of progressive technological ways of machining of details, assemblies of knots, units, machines; acquisition of labor skills

Learning Outcomes

ON5 To have the basics of strength calculations, including using modern software systems, selection of harvesting structural materials

ON6 To have the basics of designing and designing parts and assemblies of machine-building structures in accordance with the terms of reference

Learning outcomes by discipline

1. Master the skills of independent solution of engineering, economic and administrative issues

2. study the organization of metrological control of design documentation

3. Study the occupational safety and health system

Prerequisites

Fundamentals of design and machine parts

Postrequisites

Final examination

Fundamentals of scientific activity

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The course studies the basic principles, methodology, features of organizing, conducting and planning scientific research. Allows you to master the skills of conducting scientific research, applying special research methods, processing, analyzing and interpreting the data obtained as a result of conducting scientific work, testing and implementing the results obtained in practice. As a result of training, students develop the ability to work with scientific literature; the ability to find, process and correctly use information for further scientific work of students, prepare and defend student research work.

Purpose of studying of the discipline

The purpose of the discipline is to ensure the formation of students' theoretical knowledge in the field of systemic vision of the role and place of science in modern society and understanding of the directions for the development of scientific research in the field of their profile orientation.

Learning Outcomes

ON8 To make the necessary calculations in the design of machine-building enterprises, their technical equipment, equipment placement, automation, management, control in modern conditions of a market economy

Learning outcomes by discipline

1. mastering by students the main provisions on the methodology, methods and techniques of scientific research;

2. instilling skills in students in the implementation of educational-research and research work;

3. mastering the skills in working with scientific literature and information resources necessary for conducting scientific research.

Prerequisites

Manufacturing engineering Fundamentals of design of machine manufacturing engineering processes Production technology and processing methods for standard parts in mechanical engineering

Postrequisites

Final examination