Ministry of Science and Higher Education
Republic of Kazakhstan

Karaganda Industrial University

Considered at a meeting of the UMC
Protocol No. 5
"25" 04 2024

I CONFIRM:
Chairman of the UMS,
member of the Board - Vice-
Rector for Academic Affairs
Sivyakova G.A.
"26" 04 2024

CATALOG OF ADDITIONAL PROGRAMS (MINOR)

Temirtau, 2024

Content

Introduction

In order to develop additional competencies not related to the student’s field of study, together with the main educational program Major, the student is invited to study a set of disciplines and (or) modules representing the additional educational trajectory Minor.

The Minor is offered as an option to all undergraduate students. Each student is required to choose one Minor to study. The Minor is studied in the second (for students in shortened programs based on TVET) and third year (with a full term of study) of a bachelor's degree.

Minor consists of four disciplines, studied sequentially, the complexity of 20 credits (the complexity of each discipline is 5 credits).

The disciplines of the additional educational program - Minor are studied by students within the disciplines of the elective component and their volume is included in the total amount of academic credits (240 credits of the main program) required for the award of a Bachelor of Engineering and Technology degree.

The Minor is selected by the student of each educational program independently from the approved Minor catalogue.

Also, if desired, a student can, in addition to 240 credits, study other Minors on a paid basis.

Minor "IT Technologies"

Responsible for the Minor – Department of Artificial Intelligence Technologies
Labor intensity: 20 credits
Prerequisites: Information and communication technologies
Minimum number of listeners: 20
Maximum number of listeners: 80

Minor disciplines:

No.	Name of discipline	Amount of credits	lectures, h	practical work, h	SRSP, h	SRS, h	FA type
1	Basics of algorithmization	5	15	30	32	73	exam
2	Fundamentals of information security	5	15	30	32	73	exam
3	Fundamentals of digital technologies and artificial intelligence	5	15	30	32	73	exam
4	Database	5	15	30	32	73	exam

Description of disciplines:

Code and name of the discipline	**3221 Basics of algorithmization**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
The main goal of teaching the discipline “Fundamentals of Algorithmization” is to prepare students for the effective use of modern computer technology in solving programming problems by studying the C++ programming language, for students to master methods and tools, as well as the fundamentals of programming and prepare for their active use in their chosen specialty .	
Contents of the discipline:	
Study of the basic structures of algorithms, data types and operators of algorithmic languages. The concept of procedure-oriented languages and object-oriented programming. Drawing up algorithms for solving problems broken down into separate stages. Principles of modular programming. Stages of preparing and executing programs on a personal computer. Types of errors in programs.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - basics of problem algorithmization, data types, language operators; - use of subroutines, processing of data structures located on external media, standard library modules; - programming techniques and methods; - modular programming; - methods of debugging and testing programs. Be able to:	

- select suitable algorithms to solve the problem; - solve problems of processing one-dimensional and two-dimensional arrays, string data; - group program fragments into separate functions.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Information Security Basics**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Form and types of training sessions	Lectures – 15/15 Practical lessons – 30/30 SRS – 73/73; SRSP – 32/32
Prerequisites:	
Objectives of studying the discipline:	
The purpose of studying the discipline is to familiarize students with general theoretical concepts of information security and gain practical experience in the field of protecting personal information.	
Contents of the discipline:	
Study of basic information security terms. Classification of security threats to computer systems and protection against them. Formation of a security policy for computer systems. Principles of data security. Organizational methods of information protection.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - safety standards; - basics of cryptography, encryption and authentication algorithms; - requirements for personal information protection systems. Be able to: - choose appropriate data protection tools; - create a set of measures to protect information.	
Forms of final control:	Exam
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the

	results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Fundamentals of information security**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
The purpose of studying the discipline: to familiarize students with the basic principles and practical aspects of digital technologies and artificial intelligence for their application in various fields.	
Contents of the discipline:	
Structure and classification of computer networks. Basic technologies for data transmission of computer networks. TCP/IP protocol stack. Fundamentals of security in computer networks. General principles of Internet applications. Client-server architecture. Basic technologies for implementing web applications (HTML, CSS, JavaScript). Cloud computing. Approaches to creating artificial intelligence systems. Machine learning. Expert systems. Neural networks. Application of artificial intelligence in professional activities. Ethics of artificial intelligence.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - addressing methods on the Internet; - classification and structure of computer networks; - options for implementing intelligent information systems; - protocols on the basis of which software and server software operate on the Internet; - basics of the HTML language; - main types of machine learning; - types and structure of neural networks. Be able to: - determine the types and configuration of computer networks; - develop web pages with interactive elements; - change the style of web pages using CSS cascading style sheets; - generate prompts for the effective use of neural networks; - use GPT generative neural networks.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Database**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Prerequisites:	
Objectives of studying the discipline:	
The purpose of this discipline is to study the basic principles and features of database design.	
Contents of the discipline:	
Main stages of database design. Main types of database management systems. Using integrity constraints and transaction mechanisms in database design. Distributed databases. Data warehouse concept. Information security of database management systems.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - levels of the conceptual database model; - basics of the SQL language; - basics of IDEF1X database modeling methodology. Be able to: - develop a database structure for the selected area; - carry out normalization of database entities; - write scripts to create database objects and perform operations on data.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Minor "Economics and Management"

Responsible for the Minor – Department of Economics and Business
Labor intensity: 20 credits
Prerequisites: not required
Minimum number of listeners: 20
Maximum number of listeners: 80

Minor disciplines:

No.	Name of discipline	Amount of credits	lectures, h	practical work, h	SRSP, h	SRS, h	FA type
1	Management	5	15	30	32	73	exam
2	Organization and production planning	5	15	30	32	73	exam
3	Financial literacy and decision efficiency	5	15	30	32	73	exam
4	Labor Economics	5	15	30	32	73	exam

Description of disciplines:

Code and name of the discipline	**Management**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
Give an idea of management and its importance in the effective management of an organization.	
Contents of the discipline:	
Socio-economic phenomenon of management. History of development. Concept and characteristic features of modern management. Goals and objectives, principles and functions of management. System of management methods. Basic approaches to the study of management. The external environment of the manager. Organizational sphere and economic behavior in management. Leadership processes in management. Communications in management.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - principles, functions and methods of management; - types of management - psychology of management. Be able to: - use modern management technologies; - organize the work of subordinates; - motivate performers to improve the quality of work; - provide conditions for the improvement of performers.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%.

	The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Organization and production planning**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
- students mastering knowledge and skills in the field of organization, planning and production management; - acquisition of practical work skills on the main problems of the academic discipline, which include the principles and methods of managing an enterprise and its divisions, analysis of the current market situation, methods for identifying factors that caused shortcomings, and identifying possible directions and ways to eliminate them.	
Contents of the discipline:	
Organizational foundations of production. Manufacturing process and its types. Organization of labor processes and workplaces. Labor rationing. Construction of the production structure of the enterprise. Organization of continuous and automated production. Content and organization of intra-company planning. Current planning of economic and social activities. Business planning. Calculation of economic efficiency	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - basics of production and labor organization; - theory and methods for calculating the main technical and economic indicators of the enterprise's activities; - current regulatory materials on the organization and planning of production. Be able to: - design optimal operating modes, calculate staff and their payroll; - perform analysis of technical and economic indicators; - calculate the economic efficiency of implemented production, technical and technological solutions.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Financial literacy and decision efficiency**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
The purpose of the course is to develop an economic way of thinking, instill responsibility and competent behavior in the field of economic relations, develop experience in applying acquired knowledge and skills to solve basic issues in the field of family economics, as well as to carry out educational, research and project activities.	
Contents of the discipline:	
Basic principles of the functioning of the economy and economic development, goals and forms of state participation in the economy when making economic decisions. Fundamentals of economic knowledge in various fields of activity. Financial instruments for managing personal finances (budget), controlling your own economic and financial risks. Personal economic and financial planning methods to achieve financial goals.	
Knowledge and skills	
As a result of studying the discipline, the student must: **know:** -basic financial terms, concepts, financial instruments - basics of savings and investments - principles of formation and management of a personal budget - basics of tax planning and tax optimization - types and conditions of lending, principles of debt management - principles of insurance and risk management - financial security **be able to:** -plan income and expenses, set financial goals and achieve them - draw up a personal financial plan, budget - protect personal data and financial information - analyze financial reports and draw conclusions based on them - evaluate lending conditions and select optimal loan products **own:** - personal finance management skills - ability to analyze financial data - ability to use financial calculators and other tools to evaluate financial decisions - Ability to create and manage a personal budget - the ability to critically evaluate financial decisions and propose alternative options.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Labor Economics**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
The purpose of studying the discipline is for students to acquire theoretical knowledge and practical skills in the field of human resource management, rational use of labor potential, formation and regulation of social and labor relations, taking into account real processes occurring in market economic conditions and international standards for the quality of working life.	
Contents of the discipline:	
Theoretical and methodological principles of labor economics. Labor efficiency indicators. The process of forming a modern workforce and ways to increase its efficiency. The labor market as a social environment for the distribution and exchange of labor. General provisions of labor legislation. Personnel management as a condition for improving and developing labor efficiency. Division and cooperation of labor. Organization of work collectives. Remuneration and its functions. State regulation of wage issues. Remuneration: forms and systems. ILO and international experience in regulating labor relations.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - theoretical foundations of labor economics on a national, industry and specific enterprise (organization) scale; - requirements for the formation and use of labor resources; - the current state of employment and unemployment in the Republic of Kazakhstan, the mechanism of the labor market, its essence and main elements, the main directions of State policy. Be able to: - plan and calculate the labor intensity of products, the number of workers, specialists and their additional need at the enterprise (organization); - design and regulate labor productivity at the enterprise; - be able to determine employee wages.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Minor "3D engineering"

Responsible for the Minor – Department of Technological Machines and Transport
Labor intensity: 20 credits
Prerequisites: Information and communication technologies
Minimum number of listeners: 20
Maximum number of listeners: 80

Minor disciplines:

No.	Name of discipline	Amount of credits	lectures, h	practical work, h	SRSP, h	SRS, h	FA type
1	Introduction to Additive Technologies	5	15	30	32	73	exam
2	3D modeling systems and AI 3D generators	5	15	30	32	73	exam
3	3D printing tools and components	5	15	30	32	73	exam
4	Basics of 3D scanning and digitization	5	15	30	32	73	exam

Description of disciplines:

Code and name of the discipline	Introduction to Additive Technologies
Cycle of discipline	basic discipline
Discipline Component	component of choice
Goals of studying the discipline	
Students obtain general information about the development of additive technologies in the world, the prospects and possibilities of their application, the formation of competencies in the field of development, design and manufacture of products using additive technologies	
Contentdisciplines	
History of additive technologies. Design and manufacture of products using additive technologies. Basic principles of 3D printing. Basic principles of a 3D printer. The main areas of application of additive technologies. Additive manufacturing technologies. Prospects for AF technologies. Main types of additive manufacturing systems, their element base.	
Knowledge and skills	
know: - trends in the development of additive technologies and prospects for their use in production; - hardware base of additive technologies, classification, principle of operation, operating features; - basic technological processes of additive manufacturing, their limitations and functionality as a method of manufacturing products; - basic methods of work in the manufacture of products using additive technologies. **be able to:** - develop an algorithm for manufacturing products using additive technologies; - apply the acquired theoretical knowledge on additive technologies in professional activities.	

Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	3D modeling systems and AI 3D generators
Cycle of discipline	basic discipline
Discipline Component	component of choice
Goals of studying the discipline	
Gaining knowledge about the features of digital coding of 3D images, creating 3D models, features of their construction and implementation. Training in the principles and methods of creating three-dimensional models using modern technologies and artificial intelligence.	
Contentdisciplines	
General concepts of 3D modeling. Sequence of actions during 3D modeling. 3D modeling software. The process of creating 3D models, features of their construction and implementation. Formation of 3D models of products using modern software. 3D generation tools based on artificial intelligence (AI).	
Knowledge and skills	
know: - methods of representing spatial images of physical objects using 3D modeling systems; - modern software used to create 3D models; - basic work techniques when using modern 3D modeling systems. - principles of operation of AI 3D generators. **be able to:** - build 3D models of physical objects using computer technology; - apply modern 3D modeling systems when solving engineering and research problems; - apply the acquired theoretical knowledge on 3D modeling of physical objects in professional activities; - create three-dimensional models using specialized programs and AI 3D generator technologies to optimize the modeling process.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**3D printing tools and components**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Goals of studying the discipline	
The purpose of the discipline is to study 3D printing technologies, as well as the types and characteristics of materials used in the 3D printing process.	
Contentdisciplines	
Physical principles of modern elements and technical means of automation necessary to solve problems associated with the implementation of automatic control systems for 3D printers, the correct selection and calculation of their characteristics, operating principles, diagrams and basic technical data of primary and secondary devices and converters.	
Knowledge and skills	
know: - possibilities and trends in the development of modern 3D printing methods; - 3D printing hardware base, classification, principle of operation, operating features; - basic work techniques in the manufacture of products using 3D printing technology. **be able to:** - manufacture products using 3D printing technologies; - apply the acquired theoretical knowledge on 3D printing in professional activities.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Basics of 3D scanning and digitization**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Goals of studying the discipline	
Acquisition of theoretical knowledge and practical skills in technology and equipment for 3D scanning and digitization of industrial products.	
Contentdisciplines	
Review of modern 3D printing technologies. The structure and main structural elements of 3D printers. Studying the processes of manufacturing products using 3D printing. 3D printing tools and components using FDM, SLA, LOM, MJM, PolyJet technologies.	
Knowledge and skills	
know: - opportunities and trends in the development of modern 3D scanning and digitization methods; - 3D scanning hardware base, classification, principle of operation, operating features; - basic work techniques when designing products using 3D scanning technology.	

be able to: - design products using 3D scanning technologies; - apply the acquired theoretical knowledge on 3D scanning and digitization in professional activities.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Minor "Production with a full metallurgical cycle"

Responsible for the Minor are the departments of “Metallurgy and Materials Science” and “Metal Forming”

Labor intensity: 20 credits
Prerequisites: not required
Minimum number of listeners: 20
Maximum number of listeners: 80

Minor disciplines:

No.	Name of discipline	Amount of credits	lectures, h	pract. zan., h	SRSP, h	SRS, h	FA type
1	Introduction to metal forming technology	5	15	30	32	73	exam
2	Equipment for OMD workshops	5	15	30	32	73	exam
3	Introduction to metallurgy of ferrous and non-ferrous metals	5	15	30	32	73	exam
4	Technology for the production of ferrous and non-ferrous metals	5	15	30	32	73	exam

Description of disciplines:

Code and name of the discipline	**Introduction to metal forming technology**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Objectives of studying the discipline:	
The purpose of studying the discipline: to familiarize students withthe basics of rolling production, the main types of technological processes for processing materials by pressure, technologies for heating metal before processing	
Contents of the discipline:	
Main types of pressure treatment. Rolling. Forging, Stamping, Pressing. Drawing. Features of pressure processing technologies. Finishing operations before and after pressure treatment. Main and auxiliary equipment for various OMD processes. Directions for the development of promising processes, the combination of OMD processes with each other and with the casting of liquid metal. Modern and innovative technologies.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - main types of OMD; - range of main types of metal products; - areas of application and technological features of the main methods of mechanical engineering; - main and auxiliary equipment used for various OMD processes; Be able to: - select and apply methods for calculating the main parameters of technological modes and structural elements of main and auxiliary equipment;	

- select optimal operating modes of technological equipment for the production of a given type of metal product.	
Forms of final control:	Exam
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Code and name of the discipline	**Equipment for OMD workshops**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Prerequisites:	
Objectives of studying the discipline:	
The purpose of studying the discipline is to familiarize yourself with the design of the main and auxiliary equipment intended for metal forming, methods of calculating its elements for strength, rigidity, and performance.	
Contents of the discipline:	
During the course of mastering the discipline, equipment, its classification, and design features are considered depending on the area of application. Calculations are performed for gearboxes, couplings, transport mechanisms and machines, elements of straightening equipment, machines for stripping, branding, packaging and strapping of metal products. Repair issues and methods for increasing the dimensional accuracy of metal products, etc.	
Knowledge and skills	
As a result of studying the discipline, the student must: **Know:** - basic terms and concepts relating to the main and auxiliary equipment of mechanical engineering workshops; - operating conditions of metallurgical equipment intended for metal deformation; - classification of main and auxiliary equipment; - functional purpose of various types of machines and units; - features of the design and operating principles of standard equipment; - advantages and disadvantages of certain types of machines and units; - .main TEP of standard and innovative equipment of OMD workshops; - prospects for the development and modernization of OMD equipment and workshops. Be able to: - select optimal operating conditions for mechanical equipment;	

- assign and justify the choice of various main and auxiliary equipment of a more advanced design for a given method of mechanical engineering; - perform calculations for the strength and rigidity of various elements of the centralized control center; - apply modern methods of energy-power calculations when designing equipment to improve the technical and economic performance of machines; - use scientific, technical and reference data.	
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The admission rating assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining an admission rating is specified in the teacher's syllabus. It must be at least 50% (30 points). The examination mark must be at least 50% (20 points). The final grade is given only after passing the exam, taking into account the results of the current and final control in accordance with the generally accepted scale.

Module disciplines	**Introduction to metallurgy of ferrous and non-ferrous metals**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Form and types of training sessions	Lectures - 30; practical - 15; SRSP-32; SRS - 73.
Module prerequisites	-
Module learning objectives –to form an idea of the basics of modern metallurgical processing of raw materials and related elements, of the structure of production of ferrous and non-ferrous metals; study the relationship between metallurgy and fundamental and general professional disciplines; development of metallurgy, both in the world and in Kazakhstan; consider the stages of development of the metallurgical industry.	
Module content	
General characteristics of the production of ferrous and non-ferrous metals, their importance for the industrial complex of the Republic of Kazakhstan. Classification of ferrous and non-ferrous metals.Pyro-, hydro- and electrometallurgical methods for producing ferrous and non-ferrous metals.The current state of metal production in Kazakhstan, near and far abroad countries.	
Knowledge and skills	
Know: - development of metallurgy in the Republic of Kazakhstan and abroad; - main methods of metallurgical production. - types of metallurgical fuel, its main characteristics; - source materials necessary for the production of ferrous and non-ferrous metals, and methods of their preparation for smelting; - physical and chemical foundations of smelting processes of ferrous and non-ferrous metals. Be able to: - analyze the conditions for the implementation of processes for producing cast iron, steel, ferroalloys and non-ferrous metals; - evaluate the features of the main stages of production of cast iron, steel and the most common non-ferrous metals	

- navigate the technological schemes for the production of cast iron, steel, continuous casting and production of non-ferrous metals.	
Final control form	Exam
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the syllabus. The rating must be at least 30 points. The examination score must be at least 20 points.

Module disciplines	**Technology for the production of ferrous and non-ferrous metals**
Cycle of discipline	basic discipline
Discipline Component	component of choice
Form and types of training sessions	Lectures - 30; practical - 15; SRSP-32; SRS - 73.
Module prerequisites	-
Module learning objectives	
To develop knowledge about the basic technological principles of the production of ferrous and non-ferrous metals; main technological equipment.To master the general patterns of processes occurring in ferrous and non-ferrous metallurgy units; master methods for calculating the charge, material and heat balances of the process, intensifying technological processes and smelting control.	
Module content	
Technological foundations of the production process of ferrous and non-ferrous metals. Source materials for the production of ferrous and non-ferrous metals. Cast iron production technology. Steel production technology. Ferroalloy production technology. Technological features of the production of the most common non-ferrous metals in Kazakhstan.	
Knowledge and skills	
Know: - general patterns of processes occurring in ferrous and non-ferrous metallurgy units; - technical equipment of the process, features of a particular unit; - technical and economic indicators and efficiency of metallurgical shops and production facilities, their competitiveness and prospects. – basic and technological provisions for the production of ferrous and non-ferrous metals; – main technological equipment; – technical and economic indicators of processes. Be able to: - analyze, select and calculate the main process parameters and quantities of materials; - evaluate technological features, design parameters of units and workshops; - evaluate technological features of processes; – solve complex technological problems; – organize and manage experimental research in the field of metallurgy, technological processes at existing metallurgical units and promising pilot and pilot industrial complexes.	
Final control form	Exam
Conditions for obtaining loans	The final grade for the discipline consists of the grade received by the student in the exam and the rating-admission grade. The rating-admission assessment is 60% of the final grade

	in the discipline, the examination assessment is 40%. The procedure for obtaining a rating assessment - admission is prescribed in the syllabus. The rating must be at least 30 points. The examination score must be at least 20 points.