

NJSC «Kazakh national research technical university after K.I.Satpaev»

Institute of Metallurgy and Industrial Engineering

Department of "Technological machines, transport and logistics»

CURRICULUM PROGRAM

"DIGITAL ENGINEERING OF MACHINERY AND EQUIPMENT" **(scientific and pedagogical direction (2 years))**

Master of Engineering Science in the educational program 7M07111 - “Digital engineering of machinery and equipment”

on the basis of the following specialties of the invalidated Classifier of specialties:
6M072400 - Technological machines and equipment (by branches)

2nd edition

in accordance with the State Educational Standard of Higher Education 2018

Almaty 2020

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The program is compiled and signed by the parties:




from KazNRTU named after K.Satpayev:

1. The head of the department TM&TL
2. Director of M&MI
3. Chairman of EMC TM&O Department

 K.K. Elemesov
K.K. Elemesov
L.A. Krupnik

from employers:

1. Head of the production Department of Altynalmas JSC deputy Director-Vice Rector
2. General Director of Burmash LLP»
3. Commercial Director of AZTM JSC

 T.M. Mukhanov
 G. Kudaykulova
 M. Kanatbaev

from a partner University:

Head of the Department of Tmio
KazATU named after S. Seifullin

 M.A. Userbayev

Approved at the meeting of the Educational and Methodological Council of the Kazakh National Research Technical University named after K. Satpayev.

Qualification:

Level 7 National Qualifications Framework:

7M071 Engineering and Engineering (Master):

7M07111 Digital engineering of machinery and equipment

Professional competence: training of scientific, technical and engineering personnel with world-class competences in the field of digital technologies based on the integration of fundamental physical-mechanical and practice-oriented engineering and technical education with research and development for enterprises of the oil and gas, mining and metallurgical complex.

Brief description of the program:

The educational program (EP) of higher vocational education ensures the implementation of the state educational standard taking into account the type of higher education institution, the educational needs and requests of students, and includes a working curriculum, syllabuses (work programs of training courses), disciplines (modules) and other materials the quality of the training of students, as well as the program of scientific and pedagogical practice, the schedule of educational schedule and methodological materials to ensure the implementation of relevant educational technology.

The main idea of the educational program is to implement a continuous process of preparing the scientific and pedagogical and professional personnel of the new generation who are capable of working to transform the new scientific potential of Kazakhstan from raw materials to innovative through the development and implementation of sustainable trends in the field of digital service and operational services.

The uniqueness of the study program “Digital Engineering of Machinery and Equipment” is determined by the competencies that the master has, having completed his education in this program.

The Master's Program is designed to facilitate the effective training of future specialists in the field of technical services on a comprehensive and integrated foundation. It is aimed at a deep understanding of the role of digital monitoring in the operation of machines and equipment in the mining, metallurgical, and oil and gas industries and their timely service at a high level.

The program prepares masters for activities in areas such as digital engineering of machinery and equipment, as well as strategic planning, analytical and advisory activities.

At the master's level, training in the specialty 7M07111 - Digital Engineering of Machinery and Equipment is carried out along trajectories involving the implementation of educational programs for training personnel in the oil, mining and metallurgical sectors with advanced technical, analytical and prognostic training.

Awarded degree / qualification: Master of Technical Sciences in the specialty 7M07111 - "Digital engineering of machinery and equipment"

1. Objectives of the educational program

The purpose of the educational program is to prepare scientific, technical and engineering personnel with world-class competencies in the field of digital technologies based on the integration of fundamental physical-mechanical and practice-oriented engineering and technical education with research and development for the oil and gas, mining and metallurgical enterprises.

The objectives of the educational program are determined by the competencies acquired by graduates in the process of mastering the program at the university, and

provide consumers with information about the areas of vocational training, the profile of the program and the types of professional activities for which graduates of this magistracy educational program are preparing. It reflects the features of the goals of educational training of specialists in the field of technical services with scientific and innovative thinking, owning advanced technologies in the modern operational and service industry, able to integrate in the conditions of global digital engineering and solving socially important tasks of the Kazakhstan and regional service market.

OP is focused on professional social order through the formation of specific competencies (scientific-pedagogical, professional) related to the necessary types of research and practical activities, adjusted to the requirements of employers.

The goal (mission) of the MA in the field of preparation 7M07109 “Digital engineering of machinery and equipment” proclaims the training of a specialist with:

- a set of personal qualities, scientific, pedagogical and professional competencies sufficient to form modern digital technical engineering in the country (region) for the operational and service industry and advanced organization of production activities;
- the ability to reasonably combine the commercial principles of business activity, the satisfaction of social needs in the services of enterprises in the oil, mining and metallurgical industries with the humanitarian tasks of personnel development and social values of Kazakhstani society.

In forming the objectives of the study program in the direction of “7M07111 - Digital engineering of machines and equipment” for the preparation of masters, the following are taken into account

Focus on the competencies of graduates as learning outcomes (Learning Outcome-based Approach) in the design, implementation and evaluation of the program;

- requirements of the State Educational Standard of the specialty in the direction 7M07111 - “Digital engineering of machines and equipment” (magistracy);
- requirements of international standards ISO 9001: 2000, European standards and guidelines for quality assurance of higher education (ESG, Standards and Guidelines for Quality Assurance in the European Higher Education Area) within the framework of the Bologna process;

Requirements of major graduate employers.

The uniqueness of the OP "Digital Engineering of Machines and Equipment" developed in the framework of the State Educational Standard of the specialty:

- ✓ A high level of theoretical training in the field of socio-cultural, economic, legal and professional disciplines, taking into account the trends of modern scientific, pedagogical and professional social development, the inclusion in the educational process of leading domestic and foreign experts in the field of engineering services;
- ✓ High level of language training;
- ✓ development of skills in design and research activities, implementation of projects aimed at the practical application of modern professional digital techniques and technologies for organizing activities of oil and gas, mining and metallurgical enterprises;

- ✓ the optimal ratio in the educational process of theoretical and practical training (due to the targeted organization of research and production practices);
- ✓ personality-oriented approach to the educational process, focused on developing a responsible attitude to the results of their professional activities;
- ✓ the aspect of self-development, where the emphasis is placed on the organization of professional activity, in the framework of which the undergraduate is focused on continuous professional self-improvement.

2. Types of employment

A feature of this master's program is the training of graduates who are able to conduct the following types of professional activity:

- pedagogical;
- research;
- organizational and managerial;
- production and technology.

3. Objects of professional activity

The objects of graduate professional activity are:

- secondary special and higher educational institutions;
- engineering enterprises;
- design and research organizations;
- research institutes specializing in the design of technological equipment;
- organizations and companies specializing in the production of technological equipment.

EDUCATIONAL PROGRAM PASSPORT

1 Volume and content of the program

The term of study in the magistracy is determined by the volume of mastered academic credits. When mastering a set amount of academic credits and achieving the expected learning outcomes for a master's degree, the master's educational program is considered fully mastered. In the scientific and pedagogical magistracy at least 120 academic credits for the entire period of study, including all types of educational and scientific activities of the student.

Planning the content of education, the method of organizing and conducting the educational process is carried out by the university and the scientific organization independently on the basis of the credit technology of education.

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Master's degree in scientific and pedagogical direction implements educational programs of postgraduate education in the preparation of scientific and scientific-pedagogical personnel for universities and scientific organizations with in-depth scientific, pedagogical and research training.

The content of the magistracy educational program consists of:

- 1) theoretical training, including the study of cycles of basic and major disciplines;
- 2) practical training of undergraduates: various types of practices, scientific or professional internships;
- 3) research work, including the implementation of a master's thesis.
- 4) final certification.

Objectives of the educational program:

Task 1: Willingness of specialists to research and design work in the field of digital services in the process of operating technological machines, including related areas, choosing the necessary research methods, modifying existing and developing new equipment repair methods based on specific research objectives.

Task 2: Specialists' readiness for industrial and technological activities ensuring the introduction and operation of new digital developments at the local level.

Task 3: Willingness of specialists to search for and obtain new information necessary to solve professional problems in the field of knowledge integration in relation to their field of activity, to actively participate in the activities of an enterprise or organization.

Task 4: Specialists' readiness for scientific informational, ideological and problem communication in a professional environment and in a non-expert audience with a clear and deep substantiation of their position, to engage in organizational, managerial and service activities, to realize the responsibility for making their professional decisions.

Task 5: Specialists' readiness for self-learning and continuous professional development throughout the entire period of scientific or professional activity.

2 Entry Requirements

The previous level of education of applicants is higher professional education (bachelor degree). The applicant must have a diploma of a fixed pattern and confirm the level of knowledge of English with a certificate or diplomas of a fixed pattern.

The procedure for admission of citizens to the magistracy is established in accordance with the “Model rules for admission to studies in educational organizations that implement educational programs of post-graduate education”.

The formation of a contingent of undergraduates is carried out through the placement of the state educational order for the training of scientific and pedagogical

personnel, as well as tuition fees at their own expense of citizens and other sources. Citizens of the Republic of Kazakhstan shall be granted the state the right to receive, on a competitive basis, in accordance with the state educational order, free post-graduate education, if they receive education at this level for the first time.

At the "entrance" the undergraduate student should have all the prerequisites necessary for mastering the corresponding educational program of the magistracy. The list of necessary prerequisites is determined by the higher education institution independently.

In the absence of the necessary prerequisites, the undergraduate is allowed to master them on a fee basis.

3 Requirements to complete the course and receive a diploma

Awarded degree / qualifications: A graduate of this educational program is assigned an academic degree " Master of Technical Sciences " in the direction.

A graduate who has mastered the master's degree program should have the following general professional competencies:

- the ability to independently acquire, comprehend, structure and use in professional activities new knowledge and skills, develop their innovative abilities;
- the ability to independently formulate research goals, establish the sequence of solving professional tasks;
- the ability to put into practice the knowledge of fundamental and applied sections of the disciplines that determine the direction (profile) of the graduate program;
- the ability to professionally choose and creatively use modern scientific and technical equipment to solve scientific and practical problems;
- the ability to critically analyze, represent, protect, discuss and disseminate the results of their professional activities;
- Possession of skills for the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles;
- readiness to lead the team in their professional activities, tolerantly perceiving social, ethnic, confessional and cultural differences;
- readiness for communication in oral and written forms in a foreign language for solving problems of professional activity.

A graduate who has mastered the master's program must have professional competencies corresponding to the types of professional activity to which the master's program is oriented:

research activities:

- the ability to form diagnostic solutions to professional problems by integrating the fundamental sections of science and specialized knowledge gained in mastering the master's program;

- the ability to independently conduct scientific experiments and research in the professional field, summarize and analyze experimental information, draw conclusions, formulate conclusions and recommendations;
- the ability to create and explore models of the objects under study based on the use of in-depth theoretical and practical knowledge in the field of digital diagnostics of the state of equipment of mining, metallurgical and oil and gas production;
- research and production activities:
- the ability to independently carry out production and research and production of field, laboratory and interpretation work in solving practical problems;
- ability to professional exploitation of modern field and laboratory equipment and devices in the field of mastered master programs;
- the ability to use modern methods of processing and interpreting complex information to solve production problems;
- project activity:
- the ability to independently draw up and submit research and development projects;
- readiness to design complex research and production works in solving professional problems;
- organizational and management activities:
- readiness to use the practical skills of organizing and managing research and production works in solving professional problems;
- readiness for practical use of regulatory documents in the planning and organization of research and production work;
- scientific and educational activities:
- the ability to conduct seminars, laboratory and practical classes;
- ability to participate in the management of scientific and educational work of students in the field of digital technologies for diagnosing the state of the equipment of mining, metallurgical and oil and gas production.

When developing a master's program, all general cultural and general professional competencies, as well as professional competences related to the types of professional activities that the master's program is focused on, are included in the set of required mastering program results.

4 Work curriculum of the educational program

4.1. Duration 2 years

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY



MODULAR EDUCATIONAL PROGRAM

Education program 7M07111 - Digital engineering of machines and equipment"

Full-time study		Term of study: 2 years		Academic Degree: Master of technical Sciences								
Cycle	Code	Name of course			Semester	Academic credits	lecture	laboratory	practice	MSIW	Type of control	Department
Profile training module												
Basic disciplines (BD) (35 credits)												
Institute component (IC) (22 credits)												
BD 1.1.1	LNG202	Foreign language (professional)			2	6	0	0	3	3	Exam	EL
BD 1.2.1	HUM201	History and philosophy of science			1	4	1	0	1	2	Exam	SS
BD 1.3.1	HUM207	Higher school pedagogy			1	4	1	0	1	2	Exam	SS
BD 1.4.1	HUM204	Management psychology			2	4	1	0	1	2	Exam	SEPMC
Practice-oriented module												
	AAP244	Pedagogical practice			2	4					Report	TMT&L
Optional component (OC) (18 credits)												
Professional Engineering Training Module												
BD1. 5.1	TEC524	Innovative installation and commissioning methods for machines and equipment			1	6	2	0	1	3	Exam	TMT&L
BD1. 5.2	TEC517	The system of full maintenance Technological machines and equipment										
BD1. 6.1	TEC523	Intellectual Property Protection			1	6	2	0	1	3	Exam	TMT&L
BD1. 6.2	TEC277	Licensing and copyright										
BD1. 7	TEC525	Innovative drives of machinery and equipment			2	6	2	0	1	3	Exam	TMT&L
BD1. 7.2	TEC521	Innovative technologies for monitoring and diagnosing the state of technological machines										
Profile disciplines (PD) (49 credits)												
The module of innovative technologies												
Optional component (OC)												
PD2. 1.1	TEC526	Digital methods and means of measuring the parameters of technological machines			1	6	2	0	1	3	Exam	TMT&L
PD2. 1.2	TEC518	Technology of installation and commissioning technological machines and equipment										
PD2. 2.1	TEC542	Predictive maintenance systems for process equipment			2	6	2	0	1	3	Exam	TMT&L
PD2. 2.2	TEC519	Energy-saving technologies in practice of operation technological machines and equipment										

PD2. 3.1	TEC530	Digital monitoring of machines and equipment	2	6	2	0	1	3	Exam	TMT&L
PD2. 3.2	TEC520	Innovative technologies in the practice of maintenance and repair of technological machines								
PD2. 4.1	TEC532	The use of digital technology design and construction of technological machines	3	6	2	0	1	3	Exam	TMT&L
PD2. 4.2	TEC202	Innovative equipment and technologies in industry								
PD2. 5.1	TEC533	Innovative methods for repairing machine parts	3	6	2	0	1	3	Exam	TMT&L
PD2. 5.2	TEC208	Theory and practice of operation and repair of hydro machines and compressors								
PD2. 6.1	TEC544	Intelligent management of technological equipment complexes	3	6	2	0	1	3	Exam	TMT&L
PD2. 6.2	TEC209	Heattechnical equipment and power plants								
PD2. 7.1	TEC545	Lubricants and lubrication system for technological machines and equipment	3	6	2	0	1	3	Exam	TMT&L
PD2. 7.2	TEC217	Tribonika and tribology in the practical operation of the mining and metallurgical equipment								
Practice-oriented module										
PD2. 8	AAP236	Research scientific training	4	7					Report	TMT&L
Research module (24 credits)										
MSS R	AAP242	Master's student scientific research, including an internship and a master's thesis	1	6					Report	
MSS R	AAP242	Master's student scientific research, including an internship and a master's thesis	2	6					Report	
MSS R	AAP242	Master's student scientific research, including an internship and a master's thesis	3	6					Report	
MSS R	AAP242	Master's student scientific research, including an internship and a master's thesis	4	6					Report	
The module final assessment (12 credits)										
FA	ECA205	Registration and defense of the master's thesis (RaDMT)	4	12					Defense of the master's thesis	
In total:				125						

Vice-Rector for Research and Academic Affairs

Chairman of APC

Director of the Institute of M&IE

Head of department TM,T&L

 D. Nauryzbaeva

 K. Tulegenova

K. Yelemessov

 K. Yelemessov

5 Descriptors of the level and volume of knowledge, skills and competencies

Requirements for the level of training of a graduate student are determined on the basis of Dublin descriptors of the second level of higher education (magistracy) and reflect the mastered competencies expressed in the achieved learning results.

Learning outcomes are formulated both at the level of the entire master's educational program and at the level of individual modules or academic disciplines.

The descriptors reflect learning outcomes that characterize the learner's abilities:

1) demonstrate developing knowledge and understanding in the field of digital diagnostics of equipment for mining, metallurgical and oil and gas production, based on advanced knowledge of this field, in the development and / or application of ideas in the context of the study;

2) to apply at the professional level their knowledge, understanding and abilities to solve problems in a new environment, in a wider interdisciplinary context;

3) to collect and interpret information for the formation of judgments, taking into account social, ethical and scientific considerations;

4) clearly and unambiguously communicate information, ideas, conclusions, problems and solutions, both to specialists and non-specialists;

5) training skills necessary for independent continuation of further education in the field of digital diagnostics of the equipment for mining, metallurgical and oil and gas production.

6 Competences to complete the training

6.1 Requirements for key competencies of graduates of a scientific and pedagogical magistracy should:

1) *have an idea:*

- about the role of science and education in public life;
- on current trends in the development of scientific knowledge;
- about actual methodological and philosophical problems of natural (social, humanitarian, economic) sciences;
- about professional competence of a higher education teacher;
- about the contradictions and socio-economic consequences of globalization processes;

2) *know:*

- *methodology* of scientific knowledge;
- principles and structure of the organization of scientific activity;
- psychology of students' cognitive activity in the learning process;

- psychological methods and means of improving the effectiveness and quality of education;

3) *be able to:*

- use the knowledge gained for the original development and application of ideas in the context of scientific research;

- critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena;

- integrate knowledge gained in various disciplines to solve research problems in new unfamiliar conditions;

- By integrating knowledge, make judgments and make decisions based on incomplete or limited information;

- apply the knowledge of pedagogy and psychology of higher education in their teaching activities;

- apply interactive teaching methods;

- to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies;

- to think creatively and creatively to solve new problems and situations;

- be fluent in a foreign language at a professional level, allowing to conduct research and teach special subjects in universities;

- summarize the results of research and analytical work in the form of a thesis, scientific article, report, analytical note, etc .;

4) *have skills:*

- research activities, solving standard scientific problems;

- implementation of educational and pedagogical activities on the credit technology of education;

- methods of teaching professional subjects;

- the use of modern information technology in the educational process;

- professional communication and intercultural communication;

- oratory, correct and logical design of their thoughts in oral and written form;

- Expansion and deepening of knowledge necessary for daily professional activities and continuing education in doctoral studies.

5) *be competent:*

- in the field of research methodology;

- in the field of scientific and pedagogical activity in higher education institutions;

- in matters of modern educational technologies;

- in the implementation of research projects and research in the professional field;

- in ways to ensure continuous updating of knowledge, expansion of professional skills and abilities.

Competencies acquired by students during the development of the educational program «Digital engineering of machines and equipment»

Program: Digital engineering of machines and equipment	
Basic competencies (B)	
B1	Ability to abstract thinking, analysis, synthesis; readiness to act in non-standard situations, to bear social and ethical responsibility for the decisions made; readiness for self-development, self-realization, use of creative potential; ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, development and implementation of socially significant projects and to use in practice skills and abilities in organizing research and scientific
B2	Possess knowledge of the philosophical concepts of natural science and the basics of the methodology of scientific knowledge in the study of various levels of organization of matter, space and time; the ability to actively social mobility; the willingness to lead a team in the field of their professional activities, tolerantly perceiving social, ethnic, religious and cultural differences
B3	The ability to apply modern computer technologies in the collection, storage, processing, analysis and transmission of geographical information and to solve research and production and technological tasks of professional activity; to possess methods for assessing the representativeness of the material, the volume of samples during quantitative research, statistical methods for comparing the data obtained and determining patterns
B4	Ability to freely use the state language and a foreign language as a means of business communication; ability to actively communicate in scientific, industrial and socio-public spheres of activity; readiness for independent research work and work in a scientific team, the ability to generate new ideas (creativity)
Professional competencies (P)	
P1	The ability to formulate problems, tasks and methods of scientific research, to obtain new reliable facts based on observations, experiments, scientific analysis of empirical data, to refer scientific works, to make analytical reviews of accumulated information in world science and industrial activities, to summarize the results obtained in the context of previously accumulated knowledge in science and to formulate conclusions and practical recommendations based on representative and original research results
P2	The ability to creatively use knowledge of fundamental and applied sections of special disciplines of the master's program in scientific and industrial-technological activities. He is competent in the field of special technological machines, is able to justify and solve issues of rational choice of equipment to ensure the efficiency of technological processes in the industry at a professional level
P3	Master the basics of designing, expert and analytical activities and performing research using modern approaches, methods, equipment and computer systems. It is able to make descriptions of the principles of operation and device of the designed products and objects with justification of the adopted technical decisions
P4	Able to develop plans and programs of innovative activity at the enterprise, to evaluate the innovative and technological risks in implementing new technologies, to organize training and training employees in innovative activities and coordinate the work of staff at complex solving of innovative problems. It is able to carry out the selection and rational operation of technological machines and equipment in conjunction with technological processes
P5	Ready to independently or as part of a team to organize the work of production enterprises for the operation, diagnosis, repair and maintenance of equipment in accordance with the specifics of production
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P6	It is able to receive and process information from various sources using modern information technologies, is able to apply applied software tools in solving practical issues using personal computers with the use of General and special purpose software tools, including in remote access mode
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6.2 Requirements for the research work of a graduate student in the scientific and pedagogical magistracy:

- 1) corresponds to the profile of the educational program of the magistracy, on which the master's thesis is carried out and defended;
- 2) relevant and contains scientific novelty and practical significance;
- 3) is based on modern theoretical, methodological and technological achievements of science and practice;
- 4) performed using modern research methods;
- 5) contains research (methodical, practical) sections on the main protected provisions;
- 6) is based on international best practices in the relevant field of knowledge.

6.3 Requirements for the organization of practices:

The educational program of the scientific and pedagogical magistracy includes two types of practices that are conducted in parallel with the theoretical training or in a separate period:

- 1) pedagogical in the database cycle - at the university;
- 2) research in the cycle PD - at the place of the dissertation.

Pedagogical practice is conducted with the aim of developing practical skills in teaching and learning. In this case, undergraduates are attracted to conduct classes in the bachelor at the discretion of the university.

The research practice of the undergraduate is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.

7 ECTS Diploma Supplement

The application is developed according to the standards of the European Commission, Council of Europe and UNESCO / CEPES. This document is for academic recognition only and does not constitute official proof of education. Without a diploma of higher education is not valid. The purpose of completing the European application is to provide sufficient information about the diploma holder, the qualifications obtained by him, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information about the national

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education system. In the application model, which will be used for the transfer of estimates, the European system of transfer or credit transfer (ECTS) is used.

The European Diploma Supplement provides an opportunity to continue education in foreign universities, as well as to confirm national higher education for foreign employers. When traveling abroad for professional recognition will require additional legalization of the diploma of education. The European Diploma Supplement is completed in English upon individual request and is issued free of charge.

7.1 Annex to the certificate according to the standard ECTS

The app is developed according to the standards of the European Commission, the Council of Europe and UNESCO/Sepes. This document serves only for academic recognition and is not an official confirmation of the document of education. It is not valid without a higher education diploma. The purpose of filling out the European application is to provide sufficient information about the diploma holder, the qualification they have received, the level of this qualification, the content of the training program, the results, the functional purpose of the qualification, as well as information about the national education system. The application model that will be used for transferring ratings uses the European credit transfer or transfer system (ECTS).

The European diploma Supplement provides an opportunity to continue education at foreign universities, as well as to confirm national higher education for foreign employers. When traveling abroad for professional recognition, additional legalization of the diploma of education will be required. The European diploma Supplement is completed in English upon individual request and is issued free of charge.

Matrix of competencies of the educational program «Digital engineering of machines and equipment»

Discipline index	Name disciplines	Basic				Professional					
		B1	B2	B3	B4	P1	P2	P3	P4	P5	P6
Required component											
LNG202	Foreign language (professional)		x		x						
HUM201	History and philosophy of science	x	x	x							
HUM207	Higher school pedagogy		x								
HUM204	Management psychology		x					x			
Elective courses											
TEC524	Innovative installation and commissioning methods for machines and equipment						x		x		
TEC517	The system of full maintenance Technological machines and equipment						x				x
TEC523	Intellectual Property Protection	x			x		x				
TEC277	Licensing and copyright	x			x		x				
TEC525	Innovative drives of machinery and equipment						x		x		
TEC521	Innovative technologies for monitoring and diagnosing the state of technological machines					x	x		x		
TEC526	Digital methods and means of measuring the parameters of technological machines						x				
TEC518	Technology of installation and commissioning technological machines and equipment						x	x			x
TEC542	Predictive maintenance systems for process equipment						x		x		
TEC519	Energy-saving technologies in practice of operation technological machines and equipment						x		x		
TEC530	Digital monitoring of machines and equipment						x			x	
TEC520	Innovative technologies in the practice of maintenance and repair of technological machines						x		x		
TEC532	The use of digital technology design and construction of technological machines						x	x			x
TEC202	Innovative equipment and technologies in industry						x		x		
TEC533	Innovative methods for repairing machine parts						x		x		

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TEC208	Theory and practice of operation and repair of hydro machines and compressors						X			X	
TEC544	Intelligent management of technological equipment complexes						X	X	X		
TEC209	Heattechnical equipment and power plants						X				
TEC545	Lubricants and lubrication system for technological machines and equipment			X			X		X	X	X
TEC217	Tribonika and tribology in the practical operation of the mining and metallurgical equipment			X			X			X	
State final certification											
ECA205	Registration and defense of the master's thesis (RaDMT)	X	X	X	X	X	X	X	X	X	X
Additional types of training											
AAP244	Pedagogical practice	X	X	X	X	X	X	X	X	X	X
AAP242	Master's student scientific research, including an internship and a master's thesis	X	X	X	X	X	X	X	X	X	X
AAP236	Research scientific training	X	X	X	X	X	X	X	X	X	X

History and philosophy of science

CODE-HUM201

CREDIT – 4(1/0/1/2)

PREREQUISITE-HUM124

The goals and OBJECTIVES of the COURSE are to reveal the connection between philosophy and science, to highlight the philosophical problems of science and scientific knowledge, the main stages of the history of science, the leading concepts of the philosophy of science, modern problems of the development of scientific and technical reality

BRIEF COURSE DESCRIPTION the subject of philosophy of science, science dynamics, the specifics of science, science and prадnya, the antiquity and the emergence of theoretical science, main stages of the historical development of science, characteristics of science, neklassicheskie and post-non-classical science, philosophy, mathematics, physics, engineering and technology, the specifics of engineering Sciences, ethics of science, social and moral responsibility of the scientist and engineer

KNOWLEDGE and SKILLS UPON completion of the COURSE - know and understand the philosophical questions of science, the main historical stages of development of science, leading to the concept of philosophy of science, to be able to critically evaluate and analyze scientific and philosophical problems, to understand the specifics of engineering science, possess the skills of analytical thinking and philosophical reflection, to be able to justify and defend its position, own techniques of discussion and dialogue, to master the skills of commutatively and creativity in their professional work

Foreign language (professional)

Professional English for Project Managers

CODE-LNG202

CREDIT – 6 (0/0/3/3)

PREREQUISITES-Academic English, Business English, IELTS 5.0-5.5

course GOALS AND OBJECTIVES

The aim of the course is to develop undergraduates ' knowledge of English for their current academic research and to improve their performance in project management.

BRIEF DESCRIPTION OF THE COURSE

The course is aimed at developing vocabulary and grammar for effective communication in the field of project management and improving reading, writing, listening and speaking skills at the Intermediate level. Undergraduates are expected to acquire and expand their business English vocabulary and learn grammatical structures that are often used in the context of management. The course consists of 6 modules. The 3rd module of the course ends with an intermediate test, and the 6th module is followed by a test at the end of the course. The course ends with a final exam. Undergraduates also

need to study independently (MIS). MIS - independent work of undergraduates under the guidance of a teacher.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

Upon successful completion of the course, it is expected that undergraduates will be able to recognize the main idea and main message, as well as specific details when listening to monologues, dialogues and group discussions in the context of business and management; understand written and oral speech in English on topics related to management; write management texts (reports, letters, emails, meeting minutes), following a generally accepted structure with a higher degree of grammatical accuracy and using business words and phrases, talk about various business situations, using the appropriate business vocabulary and grammatical structures – in pair and group discussions, meetings and negotiations.

Pedagogy of Higher education

CODE-HUM207

CREDIT – 4 (1/0/1/2)

PREREQUISITE –

GOAL AND OBJECTIVES OF THE COURSE The course is aimed at studying the psychological and pedagogical essence of the educational process of higher education; the formation of ideas about the main trends in the development of higher education at the present stage, the consideration of the methodological foundations of the learning process in higher education, as well as the psychological mechanisms affecting the success of training, interaction, and management of subjects of the educational process. The development of psychological and pedagogical thinking of graduate students.

SHORT DESCRIPTION OF THE COURSE In the course of studying the course, undergraduates get acquainted with the didactics of higher education, the forms and methods of organizing education in higher education, the psychological factors of successful learning, the characteristics of the psychological impact, the mechanisms of educational influence, pedagogical technologies, the characteristics of pedagogical communication, and the learning process management mechanisms. They analyze organizational conflicts and ways of resolving them, psychological destruction and deformation of the personality of the teacher.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE At the end of the course, the undergraduate should know the features of the modern system of higher professional education, the organization of pedagogical research, the characteristics of the subjects of the educational process, the didactic foundations of the organization of the learning process in higher education, pedagogical technologies, the patterns of pedagogical communication, especially the educational impact on students, as well as the problems of pedagogical activity.

Management psychology

CODE-HUM204

CREDIT – 4 (1/0/1/2)

PREREQUISITE –

GOAL AND OBJECTIVES OF THE COURSE teaching undergraduates the basics of higher school psychology, expanding their professional capabilities in terms of applying psychological knowledge in the field of pedagogical activity.

GOAL AND OBJECTIVES OF THE COURSE teaching undergraduates the basics of higher school psychology, expanding their professional capabilities in terms of applying psychological knowledge in the field of pedagogical activity.

SHORT DESCRIPTION OF THE COURSE Psychological education at the university. The psychological structure of the learning process, the psychology of cognitive activity, psychological methods and means of increasing the effectiveness and quality of education in modern conditions, the psychology of the individual and student community, the education and establishment of professional self-awareness, psychodiagnostics in higher education, the psychological characteristics of the pedagogical activity of a higher education teacher studying as a subject educational activities, psychological and pedagogical communication, psychology of pedagogical impact, the main psychological problems in pedagogical activity.

KNOWLEDGE, SKILLS, SKILLS FOR COMPLETION OF THE COURSE At the end of the course, the undergraduate must master the basic knowledge, skills and abilities about the socio-psychological nature of pedagogical activity, about the properties of mental and cognitive processes included in cognitive activity, about the content and specifics of psychological and pedagogical impact, about individual characteristics of objects of influence of skill, be able to use necessary psychological and methodological resources for the preparation and conduct of classes (lectures, seminars, IWST and exams); be able to apply adequate psychodiagnostic methods to study the personality of the student and student group; manage the learning process in various aspects of communication in the field of professional activity, professional reflection, and mastery of the main methods of psychological impact.

Innovative methods of installation and adjustment of machinery and equipment

CODE-TEC524

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose of mastering the discipline is to develop knowledge and skills in using methods of installation, adjustment, diagnostics of technological equipment, methods of testing, methods and types of diagnostics.

The objectives of the discipline are to:

- providing knowledge of undergraduates in the field of installation, commissioning, maintenance and operation of modern high-performance technological equipment (mining, metallurgical and oil and gas industries), in compliance with modern requirements for environmental protection and production safety; modern technologies for high-performance production processes;

- independent training and development of new professional knowledge and skills, continuous professional self-improvement;

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline, the master must:

Know:

- state-of-the-art technologies for installation, testing, commissioning and diagnostics;

- basics of calculating labor costs for installation, testing, and commissioning;

- methods of digital technical evaluation of setup and diagnostics results;

- basics of operation of technological equipment.

Have the skills to:

- carry out installation work using modern methods and control the technical condition (welding, rolling, basic plumbing, adjustment and fitting works);

- preparation of report forms and mode maps;

- digital calculation of optimal parameters and equipment operation modes.

Intellectual property protection

CODE-TEC523

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose of studying the discipline

Formation of undergraduates ' basic knowledge in the field of intellectual property, preparation of graduates to solve professional problems related to registration of intellectual property rights and their protection, obtaining theoretical knowledge in the field of patenting and acquiring practical skills in the application of patent law as one of the components of intellectual property law in Kazakhstan, formation of a modern scientific Outlook for undergraduates, familiarization with the methodology of scientific research.

The main objectives of the discipline are:

- Study of intellectual property objects and laws in the field of intellectual property protection;

- Mastering ways to protect intellectual property rights, as well as the use of knowledge in the field of intellectual property in organizational and managerial, design and construction activities;

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline, the master must:

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Know:

- objects of intellectual property;
- rights and obligations of authors and owners of intellectual property objects;
- ways to protect the rights of authors and owners of intellectual property;
- legislation regulating relations in the field of intellectual property protection;
- rules for registration of intellectual property rights;
- major international organizations in the field of intellectual property protection;

Be able to:

- make applications for industrial property objects;
- apply options for calculating the price of a license to use an industrial property object (primarily technical ones);
- protect the rights of authors and owners of intellectual property objects;
- conduct patent research;
- use the information resources of FIPS;

Possess:

- knowledge of the legislation regulating relations in the field of intellectual property protection
- rules for processing applications for industrial property objects;
- ways to protect intellectual property rights.
- skills in conducting patent research.

Licensing and copyright

CODE – TEC277

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

At discipline studying theoretical and practical preparation of the future masters concerning tehniko-legal bases of the copyright, protection "know-how" and licencing, a right protection of objects of the industrial property, drawing up and giving of patent demands and their examinations is carried out. Acquaintance to a role and value of objects and subjects of the copyright, conditions of patentability of the invention and industrial samples and possibilities of their licensing, gives the chance trained to master: sequence of registration of copyrights, maintenances of copyrights; ability to protect the right of authors and the patent of owners; ability to make registration of copyrights abroad; bases of a right protection and "know-how" protection.

Be able to:

- make applications for industrial property objects;
- apply options for calculating the price of a license for the use of an industrial property object (primarily technical ones);
- protect the rights of authors and owners of intellectual property objects;
- conduct patent research;
- use the information resources of FIPS;

Possess:

- ideas about the legislation regulating relations in the field of intellectual property protection
- rules for registration of applications for industrial property objects;
- ways to protect intellectual property rights.
- skills in conducting patent research

Innovative drives for machinery and equipment

CODE – TEC525

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose of the discipline is to form a system of knowledge, skills, and skills in the field of design, operation, maintenance, and evaluation of the technical condition of industrial machine drives.

Objectives of the discipline:

- formation of knowledge about the features of innovative designs, layout and operating modes of mechanical, hydraulic and pneumatic drives of mining, metallurgical and oil and gas machines;
- formation of skills to assess the technical condition and residual life, organize preventive inspection and maintenance of mechanical, hydraulic and pneumatic drives of mining, metallurgical and oil and gas machines;
- formation of skills in applying methods for calculating design and operating parameters of innovative mechanical, hydraulic and pneumatic drives of mining, metallurgical and oil and gas machines.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline, the master must:

Know:

- features of innovative design and basic layout schemes, methodology for selecting and calculating rational parameters of operation of mechanical, hydraulic and pneumatic drives of technological machines;
- main malfunctions of hydraulic and pneumatic drives of technological machines and their diagnostic signs, methods and means of assessing the technical condition of hydraulic and pneumatic drives of mining machines;

Be able to:

- apply standard calculation methods when selecting and justifying design and operating parameters of hydraulic and pneumatic drives of mining machines and equipment;
- organize preventive inspection and maintenance of hydraulic and pneumatic drives of mining machines and equipment;

Possess:

- skills in using reference and scientific and technical literature when performing design and operational calculations of hydraulic and pneumatic drives of mining machines and equipment;
- skills in assessing the technical condition of hydraulic and pneumatic drive units of mining machines, can use measuring and diagnostic equipment.

Innovative equipment and technologies in industry

CODE – TEC202

CREDIT – 6 (2/0/1/3)

PREREQUISITE

Purpose of the discipline – The application of the knowledge gained to determine the formulation and adoption of technology and engineering problems, using appropriate methods.

- The ability to select and use appropriate equipment, facilities and tools.
- The ability to develop processes of manufacturing blanks, parts, assembly units.
- Be able to find creative solutions to typical problems or be able to solve non-standard problems.
- The ability to think creatively and creative approach to new challenges.

The master's student will be able to apply innovative technologies and tools for technical diagnostics and repair of metallurgical equipment in practice

Digital methods and tools for measuring the parameters of technological machines

CODE – TEC526

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

Digital methods and tools for measuring and controlling technological machines. Devices and digital methods for measuring temperatures, pressures, flow rates of liquids and gases, linear and angular values, measuring forces and moments, non-destructive testing of materials and products, motion and vibration parameters, gas composition, quality of technical liquids, quality of fuels and oils. Metrological and dynamic characteristics of measuring and control devices. Selection of modern technical means for measuring and controlling the parameters of technological machines, depending on their design and operating conditions. Evaluation of the accuracy and reliability of measuring instruments. Rules for installation and operation of technical measuring instruments. Types of testing of technological machines – control, research, parametric, delivery, diagnostic, resource, etc. Test benches and equipment. Assessment of the technical condition of technological machines based on test results.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of mastering the discipline, the master must:

Know:

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- Basic concepts of measurement theory, digital, physical quantities and units of measurement, and General laws and rules of measurement;
- objects and methods of digital measurements;
- fundamentals of technical measurements in mechanical engineering
 - means of measurement;
 - measurement error;
 - Instrument error and the measurement error of the instrument
- principles of unity of measurement;
- basic concepts of interchangeability and its types;
- state system for ensuring the uniformity of measurements (GSS);
- intersectoral systems of standards: ESKD, ESTD, ESPD, SRPP;
 - product quality management system;
- universal and special measuring devices;

Be able to:

- Select measurement systems for monitoring and regulating process parameters, evaluate the reliability and economic efficiency of the selected measurement system;
- Select methods to compensate for measurement errors caused by external factors (changes in ambient temperature, exposure to electric and magnetic fields, etc.)
 - control the linear and angular dimensions of parts;
 - choose universal and special measuring instruments;
 - perform verification of measuring instruments in production;
 - design technological processes and technical control operations.

Have:

In the calculation of parameters of elements of measuring systems, in the verification and adjustment of measuring devices and primary converters in volumes sufficient for research and operation in industrial conditions;

Application of digital technologies in the design and construction of technological machines

CODE-TEC532

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

Purpose of the discipline

To acquaint undergraduates with the use of digital systems for designing technological machines and equipment, modern digital developments and the main directions of development of digital design and construction of technological machines, as well as with the technological preparation of their production.

Tasks of the discipline.

To provide undergraduates with knowledge in the field of digital systems for designing technological machines and equipment for mining, metallurgical and oil and

gas production, to introduce them to modern developments and the main directions of development of digital design of technological machines and production preparation.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of studying this discipline, undergraduates should have an idea

- about digital design systems for technological machines and their application at the design stage;

- about modern developments and main directions of development of digital design of mining, metallurgical and oil and gas production and technological preparation of their production.

know:

- principles of digital design technologies for machines and technological processes in industrial engineering;

- structure and capabilities of modern digital graphics systems.

be able to:

- use modern elements of digital design systems in solving technological and design tasks;

- work with databases, subsystems, and application software packages that form digital design systems for machines and their manufacturing processes.

Digital monitoring of machinery and equipment condition

CODE-TEC530

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose of the discipline: to study methods of digital diagnostics, rules and conditions of work in the field of determining the technical condition of equipment; to gain practical skills in the use of non-destructive testing methods to assess the technical condition and determine the residual life of technological machines and equipment in the oil and gas industry.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of studying the course, masters must:

Have:

- calculation of reliability of technological equipment and individual components and mechanisms, drives of technological equipment and special devices;

- monitoring of current parameters and actual performance of technological equipment in accordance with the requirements of regulatory and technical documentation to identify possible deviations;

- diagnostics of possible system failures and failures for selecting methods and methods of their elimination;

- organization of work on Troubleshooting, equipment failures and repair of technological equipment within the scope of its competence.

Be able to:

- calculate the reliability of technological equipment and individual components and mechanisms;
- determine the reliability indicators of technological equipment;
- perform technical control of compliance of parameters of devices and functional blocks of automation systems with the established standards;
- choose diagnostic methods and measurement tools to identify the causes of malfunctions and failures;
- conduct various types of occupational safety training;
- evaluate the performance of devices and functional blocks of automation systems based on indicators of technical diagnostic tools;
- calculate reliability indicators of devices and functional blocks of automation systems;
- identify the causes of malfunctions and failures of devices and functional units of technological equipment using visual monitoring and technical diagnostics;
- keep a constant record of failures and failures to identify and eliminate the causes of their occurrence;
- organize and control the work of personnel to carry out routine repairs of control equipment and systems, functional units of automatic control systems using measurements and tests.

Know:

- indicators of reliability of components and parts of technological equipment; rules of operation of technological equipment;
- procedure and frequency of scheduled preventive and preventive maintenance;
- purpose of devices and mechanisms of technological equipment, features of their operation, practical application possibilities and main dynamic characteristics;
- technical characteristics of mechanisms and structures of technological equipment, basic kinematic schemes;
- digital means of measuring the performance of technological equipment, their scope, device and design features;
- main technological parameters of devices and functional blocks of technological equipment and methods of their measurement;
- technical and metrological characteristics of devices and functional blocks of automation systems;
- methods of diagnostics and restoration of operability of technological equipment, individual mechanisms and components;
- regulatory and legal documentation on labor protection.

Pedagogical practice

CODE – AAP244

CREDIT – 4

PREREQUISITE –

GOALS OF MASTERING THE DISCIPLINE

- The use of modern scientific knowledge in the discipline in the educational process, the use of innovative technologies in the organization of the educational process.
- Creating conditions for achieving professional competence in accordance with the requirements of the standard in the field of training.
- Preparation for teaching activities in mining, metallurgical and oil and gas production. Creation of scientific and pedagogical educational programs related to modern tasks of mining, metallurgical and oil and gas production, for use in scientific and technical universities and educational institutions.

Pedagogical practice sets its own goals:

- Use at a new level of theoretical knowledge in pedagogy, psychology and teaching methods obtained in the course of studying for a master's degree.
- Checking the degree of readiness for independent scientific and pedagogical activity.
- Introduction to new educational standards.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of teaching practice, a master's student must:

Know:

- the content of current state educational standards;
- modern teaching methods;

Be able to:

- develop the subject and methodological content of training sessions for students of secondary, special and higher educational institutions;
- evaluate the effectiveness of educational activities;

Have the skills:

- conducting classes in educational institutions;
- methodically correctly build a plan of lectures (practical classes);
- public presentation of theoretical and practical sections of academic disciplines in accordance with approved teaching AIDS.

Innovative methods for restoring machine parts

CODE – TEC533

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose and objectives of the discipline is to provide a specialist with up-to-date knowledge on the technology of restoring specific parts of mining, metallurgical and oil and gas production equipment.

In the process of mastering this discipline, the following tasks are solved:

- familiarization of undergraduates with the principles of choosing a rational technological process for restoring and strengthening parts of mining, metallurgical and oil and gas production, depending on the type of wear;
- familiarization with innovative methods for restoring parts that have undergone wear, destruction and fatigue failure as a result of the operation of technological equipment.
- to study and master in practice innovative principles, methods and tools for developing the technological process of restoration and strengthening;
- obtaining theoretical knowledge and practical skills in selecting equipment and devices for the developed technological process;
- formation of skills for rational use of basic and additional materials for restoration and strengthening;
- acquisition of practical skills in filling out regulatory and technical and technological documentation for the repair and restoration of equipment parts.

KNOWLEDGE, SKILLS AT THE END OF THE COURSE

As a result of studying this discipline, a master's student should:

- technical and economic basis for choosing innovative methods and technologies for restoring and improving the wear resistance of equipment parts;
- principles of using materials that ensure maximum wear resistance under various types of wear;
- basic requirements of regulatory and technical documentation for the restoration and strengthening of parts and assemblies;
- basic requirements for the safe conduct of repair and restoration work.

Be able to:

- choose modern low-waste, energy-saving and environmentally friendly engineering technologies for restoring and strengthening parts of oil and gas equipment;
- develop technological processes for strengthening or restoring parts;
- choose the necessary equipment, tools and accessories;
- choose the main and auxiliary materials of parts and coatings;
- determine and ensure the manufacturability of parts during their restoration and strengthening;
- to create technical and maintenance documentation;
- conduct a technical and economic analysis of the selected technology.

Own:

- skills in developing process maps for restoring and improving the wear resistance of parts;
- practical skills in drawing up project and technical documentation;
- practical skills to check the compliance of the developed technological process with the requirements of standards, technical conditions and other regulatory documents.

Theory and practice of operation and repair of hydro machines and compressors

CODE – TEC208

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

On the basis of studying of the given course the master will receive representation about forms and methods of operation and repair of the oil and gas equipment, features of their service and repair in field conditions and bases of industrial service. Will master the basic receptions of operation and equipment repair; rules of formation of industrial divisions, their structure and acquisition by brigades. The organisation of productions of structural divisions. Forms and rules of interaction with the foreign enterprises, specialisation and cooperation in industrial activity. Knowledge of these features will help fast adaptation of the expert with practical activities, to carrying out of the analysis of efficiency of activity of various divisions.

Predictive maintenance systems for process equipment

CODE – TEC542

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

Formation of undergraduates knowledge and skills in the application of digital methods for predicting the technical condition and reliability of objects, studying the basics of the theory of diagnostics, studying the basic concepts, techniques and innovative methods for diagnosing the technical condition of parts, mechanisms and products.

The tasks of the master's degree course are determined by the requirements of the qualification characteristics of the specialty and are aimed at teaching undergraduates to use digital computer technologies and forms of organization of diagnostics in the maintenance and repair of technological machines and equipment, as well as to use in practice data on the assessment of the technical condition of technological machines and equipment obtained using digital diagnostic equipment and indirect signs.

Heattechnical equipment and power plants

CODE – TEC209

CREDIT – 6 (2/0/1/3)

PREREQUISITE –

The purpose of the discipline is to master the methods of obtaining, converting, transferring and using heat, which allows you to save fuel and energy resources during the operation of technological machines and equipment, to intensify technological processes, to identify and use secondary energy resources, as well as to protect the environment from pollution by fuel combustion products

- principles of economic operation of modern heat and power equipment;

- modern ways to protect the environment from contamination by fuel combustion products of heat and power equipment;
- thermodynamic properties of real gases and vapors;

basic requirements for the rational and safe conduct of the operation associated with the use of heat engines.

to be able:

- possess the calculated ratios of heat engineering and the skills of rational use of heat in thermal processes;
- perform thermal calculations of heat exchangers;
- to solve the problems of efficient operation of heat engineering equipment using modern methods of using heat;
- experimentally determine the characteristics of the thermal state of elements of thermal machines and apparatuses;
- make measurements of the main heat engineering indicators related to the profile of engineering activities;
- solve various applied problems related to heat engineering calculations in the operation of heat engineering installations and heat machines.

Ability to integrate knowledge gained in different disciplines and use it to solve production problems, develop technical specifications for the design and manufacture of electrical equipment

Intelligent management of technological equipment complexes

CODE – TEC544

CREDIT – 6 (2/0/1/3)

PREREQUISITE-

the Discipline provides for the study of the organization and operation of enterprises for the maintenance of production complexes of technological equipment in the system of industrial purpose. The purpose of teaching the discipline is to master the methodology for managing the complex of technological equipment of industrial enterprises of the mining, metallurgical and oil industries and methods for calculating their production capacities, as well as to study the optimal algorithms for managing production systems when servicing production facilities.

Lubricants and lubrication system for technological machines and equipment

CODE – TEC545

CREDIT – 6 (2/0/1/3)

PREREQUISITE

The purpose of teaching the discipline is to study the hydrodynamic theory of lubrication, where the viscous flow for a Newtonian fluid, the basic equations of hydrodynamics, the continuity equation, the equation of motion (Navier-Stokes equation) and the energy equation will be considered. Issues related to modern lubricants used in

engineering, their distinctive quality properties, tools and devices for carrying out lubrication operations will also be considered. The practical classes will be used to calculate the friction characteristics in the hydrodynamic lubrication mode, the presence of a lubricating film between the rubbing surfaces, and the problems of friction in the hydrodynamic lubrication mode according to Couette's law.

Tribonika and tribology in the practical operation of the mining and metallurgical equipment

CODE – TEC217

CREDIT – 6 (2/0/1/3)

PREREQUISITE

Purpose of study: Give undergraduates the necessary theoretical foundations and triboniki tribotechnology in practice exploitation of mining and metallurgical equipment.

Brief content: The main idea of the friction and tribotechnology friction concept, lubrication and wear .: Course Objectives. Course structure. Basic definitions. Concept of friction, lubrication concept. Concept of deterioration. Concepts of micro- and nanotribology. solid surface. The surface of a physical object. surface topology. Modern methods of investigation surface. Contact Interaction of Solids. The elastic and plastic contact smooth bodies. Adhesion interaction of bodies. Contact rough surfaces. Physics of sliding friction and rolling. The main factors of friction. Calculation of the coefficient of sliding friction. Frictional self-excited vibrations. Thermal friction problem. The main factors of rolling friction. Calculation of the coefficient of rolling friction. The physics of fluid friction. The main factors of fluid friction. The physical laws of fluid motion. Petrov Formula. Formula Zhukovsky. Reynolds equation. Wear Physics. Basic mechanisms of wear: abrasive wear, adhesive wear, fatigue wear, corrosion-wear, combined types of wear. Methods and means of measuring and control wear. Tribological database. anotribologiya. The friction at the atomic and molecular level. Methods of molecular dynamics simulation of processes of friction, lubrication and wear. Methods and means of measuring and control properties of nanomaterials.

Expected results: Graduate will be able to put into practice the theoretical patterns of the design and construction of metallurgical machines

Master's thesis defense

CODE – ECA205

The CREDIT is 12

The purpose of the master's thesis is

to demonstrate the level of scientific/research qualifications of the master's student, the ability to independently conduct scientific research, test the ability to solve specific scientific and practical problems, knowledge of the most General methods and techniques for solving them.

BRIEF DESCRIPTION

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Master thesis – graduation qualification scientific work, which is a generalization of the results of independent studies undergraduates one of the pressing problems of a particular specialty relevant branch of science that has internal unity and reflects the progress and results of the development of the chosen topic.

Master's thesis-the result of research /experimental research work of a master's student, conducted during the entire period of study of a master's student.

Master's thesis defense is the final stage of master's degree preparation. The master's thesis must meet the following requirements –

- the work must conduct research or solve current problems in the field of operation and repair of mining, metallurgical and oil and gas production;
- the work should be based on identifying important scientific problems and solving them;
- decisions must be scientifically based and reliable, have internal unity;
- the dissertation work must be written individually;

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