

**Ministry of Science and Higher Education of the Republic of Kazakhstan  
Kazakh National Research Technical University  
named after K.I. Satpayev**

**MODULAR DIRECTORY  
for the educational master's program  
Digital engineering of machines and equipment (Master's degree) /  
Technological machines and equipment (Master's degree)**

**Almaty, 2022**

**Digital engineering of machines and equipment** (Master's degree) /  
**Technological machines and equipment** (Master's degree)

Module designation	<i>Social and Social module M-1. Module of basic training</i>
Name of disciplines included in this module	5 credits – English (professional). 3 credits – Management Psychology. 3 credits – History and philosophy of science. 3 credits – Higher school pedagogy.
Semester(s) in which the module is taught	<i>Autumn, Spring (1,2)</i>
Person responsible for the module	<i>Anasova Kalamkas Temirkulovna Turlybekova Anar Orymbaevna</i>
Language	<i>Kazakh, Russian, English</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>Lecture, practical work, independent work of a master's student.</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 420 hours Lectures 45 Practical 90 IWMS 285</i>
Credit points	<i>14</i>
Required and recommended prerequisites for joining the module	<i>Intermediate English, Philosophy</i>
Module objectives/intended learning outcomes	<i>The purpose of the module is to study the foundations and boundaries of science and technology, the laws of their development, prospects and strategies for future existence using a philosophical approach. Formation of professionally oriented communicative competence of undergraduates, which allows them to integrate into the international professional environment and use professional English as a means of intercultural and professional communication. As well as studying the basics of education management, management of global educational processes and the basics of management psychology. The master's student will be able to identify and analyze the connections, correlation between natural-scientific, technical and philosophical fields of knowledge, their mutual determination, place and role in culture. He will know the main problems of modern science and technology, the prospects for new discoveries, and outline ways out of the crisis of man-made civilization. Know the basics of education management, management of global educational processes.</i>

Content	<p><i>Familiarization of undergraduates with the history of the formation and development of science, technology, its conceptual basis; to present the foundations and structure of science, technology; to consider the features of the current stage of science development and its prospects; to substantiate the principles and laws of categorical thinking in the field of science; to analyze the methods and procedures of scientific knowledge; to present basic natural science theories within the boundaries of the mega -, macro -, microcosm; to determine the philosophical foundations and boundaries of technology; to demonstrate the variety of meanings of technology and ways of its implementation.</i></p> <p><i>Study of the basics of education management, management of global educational processes, analysis and selection of strategic initiatives, a project as a strategy for managing the development of an educational institution/organization. Also, undergraduates will study marketing of education, human resource management in educational organizations, information and communication technologies in the field of education and management of the educational process (on the example of a higher school). Training in the basics of management psychology. Specifics of management psychology, psychological patterns of managerial activity, personality and its potential in the management system; motivation and effectiveness in the organization, leadership and leadership in modern management of organizations, social group as an object of management, psychological foundations of managerial decision-making, business communication and managerial conflicts, psychology of responsibility, image creation as an integral part of communication culture, psychology of advertising.</i></p>
Exams and assessment formats	<p><i>Two amount of time and points at the discretion of the teacher, but the total time allocated to the student to provide an answer to the exam ticket should not exceed 120 minutes, and the maximum number of points is 40. And also the teacher adheres to the following assessment criteria: written / oral intermediate tests (30 minutes each) and one final oral exam (40 minutes), short computer quizzes, written homework assignments</i></p> <p><i>The module exams are conducted in the format of test tasks. The test consists of several sections, each of which is allocated a certain</i></p>

<p>Study and examination requirements</p>	<p><i>Requirements for successful completion of the module for example, the final assessment of the module consists of 60% of academic performance in exams, 10% of quizzes, 10% of homework, 10% of participation in the class. To pass the exam, students must have a final grade of 60% or higher.</i></p> <p><i>Admission of students to the exam in the discipline is carried out automatically:</i></p> <ul style="list-style-type: none"> <li>- based on the assessment of the admission rating, determined by the results of the current and boundary control of academic performance (the total number of required semester points is at least 25 for two attestations);</li> <li>- those who have no outstanding tuition fees;</li> <li>- those who do not have more than 20% of skipping training sessions in the discipline;</li> <li>- not being on academic leave or academic break;</li> </ul> <p><i>those who do not have an overdue medical examination.</i></p> <p><i>The final assessment of the discipline includes assessments of current academic performance and final control. The assessment of current academic performance (admission rating) is 60% of the final assessment of knowledge in the discipline, the assessment of the exam is 40% of the final assessment of knowledge in this discipline. Thus, the final score for each discipline is determined as the sum of the points scored by the student according to the results of the current and boundary performance controls (rating - maximum 60 points, minimum 25 points) and the exam (final control - maximum 40 points, minimum 20 points), which together makes up a maximum of 100 points.</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> <li>1) Valiano M. V. <i>History and philosophy of Science [Electronic resource]: Textbook.</i> M oskva: Alfa-M; M oskva: LLC "Scientific and Publishing Center INFRA-M", 2015. - 208 p. (EBS "INFRA-M")</li> <li>2) Bessonov B. N. <i>History and philosophy of science: textbook. the manual / B. N. Bessonov.</i> - M oskva : Yu wright : I D Yurite, 2010. - 394, [6] p.</li> <li>3) <i>History and Philosophy of Science = The History and the Philosophy of Science: studies. manual / under the general ed. S. A. Lebedev.</i> - M oskva : Akad. Project : Alma Mater, 2007. - 606, [2] p.</li> <li>4) Ostrovsky E. V. <i>History and philosophy of science: textbook. handbook for university students / E. V. Ostrovsky.</i> - Moscow State Academy of Sciences: Yu NITI-DANA, 2007. - 159, [1] p.</li> <li>5) V. L. Kaushanskaya, R. L. Kovner, O. N. Kozhevnikova, E. V. Prokofiev, 3. M. Raines, S. E. Skvirskaya, F. Ya. Tsyrlina <i>A GRAMMAR OF THE ENGLISH LANGUAGE</i></li> <li>6) <i>English for academic study: Reading and Writing. Source Book.</i> - Slight J., Harben P., Pallant A. University of Reading 2006</li> <li>7) <i>Listening Extra. Resource book.</i> - Miles Craven. Cambridge University Press 2004</li> <li>8) Bordovskaya N. V., Rean A. A. <i>Pedagogy</i>, St. Petersburg, 2008</li> <li>9) Isaev I. F. <i>Professional and pedagogical culture of a teacher: Textbook. for university students.</i> M., 2003.</li> <li>10) Shane E. <i>Organizational culture and leadership.</i> St. Petersburg Publishing House, St. Petersburg, 2002.</li> </ol>

Module designation	<b>Professional engineering training module</b>
Name of disciplines included in this module	<p>5 credits – (this block consists of the following elective disciplines: Intellectual Property Protection; Licensing and copyright)</p> <p>5 credits – (this block consists of the following elective disciplines: Innovative installation and commissioning methods for machines and equipment; The system of full maintenance Technological machines and equipment)</p> <p>5 credits – (this block consists of the following elective disciplines: Innovative drives of machinery and equipment; Innovative technologies for monitoring and diagnosing the state of technological machines)</p>
Semester(s) in which the module is taught	Autumn (1,3)
Person responsible for the module	Kaliyev Bakytzhan Zautbekovich
Language	Kazakh, Russian, English
Relation to curriculum	Specialization
Teaching methods	Lecture, practical work, independent work of a master's student.
Workload (incl. contact hours, self-study hours)	<p>Total workload:</p> <p>450 hours</p> <p>Lectures 90</p> <p>Practical 45</p> <p>IWMS 315</p>
Credit points	15
Required and recommended prerequisites for joining the module	Physics, Mathematics II, Installation and operation of technological machines, Repair of technological machines
Module objectives/intended learning outcomes	<p>The purpose of the module is to familiarize undergraduates with innovations in the field of installation, commissioning, MRO, monitoring and diagnostics of technical condition.</p> <p>Will know the essence of innovative solutions, calculation methods with research elements.</p> <p>Be able to put into practice innovative solutions in the above-mentioned areas using modern technical means and digital technologies.</p>
Content	<p>Theoretical foundations of technical operation, strategies and methods for ensuring the operability of technological machines and equipment, systems of organization and rational technology of maintenance and routine repairs; main tasks and systems of technical diagnostics; diagnostic tools and diagnostic parameters; systems for collecting and processing diagnostic signals; vibration diagnostics of equipment; parametric diagnostics of equipment; acoustic emission diagnostics; tribodiagnostics (analysis of the quality of lubricant (oil) and detection of wear particles); thermal imaging and thermography; organization of control and diagnostics of technological equipment during its manufacture and operation; patterns of changes in the technical condition of technological machines; systems for organizing maintenance and repair of technological machines; methods for ensuring the operability of technological machines; complex indicators for assessing the quality of maintenance and repair of technological machines; patterns of forming productivity and throughput of service facilities.</p>

Exams and assessment formats	<p><i>Exams for the module are conducted in writing. The exam ticket consists of 3 questions (situational tasks, calculations), each of which is allocated a certain amount of time and points at the discretion of the teacher, but the total time allocated to the student to provide an answer to the exam ticket should not exceed 120 minutes, and the maximum number of points is 40. And also the teacher adheres to the following assessment criteria:</i></p> <ol style="list-style-type: none"> <li><i>1. Accuracy – 35%.</i></li> <li><i>2. Completeness of the solution of the problem – 35%.</i></li> <li><i>3. Creativity and originality – 30%.</i></li> </ol>
Study and examination requirements	<p><i>Admission of students to the exam in the discipline is carried out automatically:</i></p> <ul style="list-style-type: none"> <li><i>- based on the assessment of the admission rating, determined by the results of the current and boundary control of academic performance (the total number of required semester points is at least 25 for two attestations);</i></li> <li><i>- those who have no outstanding tuition fees;</i></li> <li><i>- those who do not have more than 20% of skipping training sessions in the discipline;</i></li> <li><i>- not being on academic leave or academic break;</i></li> </ul> <p><i>those who do not have an overdue medical examination.</i></p> <p><i>The final assessment of the discipline includes assessments of current academic performance and final control. The assessment of current academic performance (admission rating) is 60% of the final assessment of knowledge in the discipline, the assessment of the exam is 40% of the final assessment of knowledge in this discipline. Thus, the final score for each discipline is determined as the sum of the points scored by the student according to the results of the current and boundary performance controls (rating - maximum 60 points, minimum 25 points) and the exam (final control - maximum 40 points, minimum 20 points), which together makes up a maximum of 100 points.</i></p>
Reading list	<ol style="list-style-type: none"> <li><i>1) Cherepanov A. N. Maintenance and repair. Modern approaches to the construction of the system. - M.: Nobel Press. 2013. 218 p.</i></li> <li><i>2) Chichenev N. A. Operation of technological machines. - M.: NUST MISIS. 2014.</i></li> <li><i>3) Khasanov R. H., Faskiev R. S., Keyan E. G., Bondarenko E. V. Technical operation and repair of technological equipment.- Orenburg, IPK GOU OSU. 2011.</i></li> <li><i>4) A. FMD. The system of maintenance and repair of general industrial equipment. Reference book. - Moscow: NC ENAS. 2006</i></li> <li><i>5) Kasatkin N. L. Repair and installation of metallurgical equipment. - M., "Metallurgy", 2006. - 310</i></li> <li><i>6) Pokrovsky, B. S. Mechanical assembly works. Basic level / B. S. Pokrovsky. - M.: Academy, 2007.</i></li> <li><i>7) Pokrovsky B. S. Mechanical assembly works and their control. - M.: Higher School, 1989.</i></li> <li><i>8) Beisenov B. S. Installation and operation of technological machines. Training manual. - Almaty, KazNTU, 2015.</i></li> <li><i>9) Krylov V. A. Installation of metallurgical equipment. - M., "Metallurgy", 2008, - 44 p.</i></li> <li><i>10) Zhirkin, Yuri Vasilyevich. Installation, operation and repair of metallurgical machines [Electronic resource] - Magnitogorsk: Magnitogorsk State Technical University named after G. I. Nosov, 2014.</i></li> </ol>

Module designation	<b><i>The module of innovative technologies M-2. Module of professional activity</i></b>
Name of disciplines included in this module	<p><i>5 credits – Digital methods and means of measuring the parameters of technological machines.</i></p> <p><i>5 credits – Digital monitoring of machines and equipment.</i></p> <p><i>5 credits – Predictive maintenance systems for process equipment.</i></p> <p><i>5 credits – Energy-saving technologies in practice of operation technological machines and equipment.</i></p> <p><i>5 credits – (this block consists of the following elective disciplines: The use of digital technology design and construction of technological machines; Innovative equipment and technologies in industry).</i></p> <p><i>5 credits – (this block consists of the following elective disciplines: Intelligent management of technological equipment complexes; Heattechnical equipment and power plants).</i></p> <p><i>5 credits – (this block consists of the following elective disciplines: Instrumentation and equipment technology machines and equipment; Innovative technologies in the practice of maintenance and repair of technological machines; Project Management).</i></p> <p><i>5 credits – (this block consists of the following elective disciplines: Innovative methods for repairing machine parts; Theory and practice of operation and repair of hydro machines and compressors).</i></p> <p><i>5 credits – (this block consists of the following elective disciplines: Innovative construction materials of technological machines; Lubricants and lubrication system for technological machines and equipment)</i></p>
Semester(s) in which the module is taught	<i>Autumn, Spring (1,2,3)</i>
Person responsible for the module	<i>Beisenov Baurzhan Sakkouly Zaurbekov Seitzhan Aryspekovich</i>
Language	<i>Kazakh, Russian, English</i>
Relation to curriculum	<i>Specialization</i>
Teaching methods	<i>lecture, practical work, calculations.</i>
Workload (incl. contact hours, self-study hours)	<p><i>Total workload:</i></p> <p><i>1350 hours</i></p> <p><i>Lectures 270</i></p> <p><i>Practical 135</i></p> <p><i>IWMS 945</i></p>
Credit points	<i>45</i>
Required and recommended prerequisites for joining the module	<i>Installation and operation of technological machines, Repair of technological machines, Innovative methods of installation and adjustment of machines and equipment, Innovative technologies for monitoring and diagnosing the state of technological machines, Innovative drives of machines and equipment</i>
Module objectives/intended learning outcomes	<p><i>The purpose of the module is to familiarize undergraduates with the applied aspects of digital technologies in measuring the parameters of technological machines, assessing the condition and predictive maintenance with elements of energy efficiency and green technologies. Obtaining knowledge on the main problems of the use of digital technologies in the management of technological machines (TM) and equipment, taking into account the latest achievements in control theory</i></p> <p><i>The master's student will know: Digital methods and means of</i></p>

<p>Module objectives/intended learning outcomes</p>	<p><i>measuring parameters and assessing the condition of technological machines, features of the technology of installation and commissioning of technological machines and equipment, the essence of predictive maintenance, energy-saving technologies in the practice of operating technological machines and equipment, the use of digital technologies in the design and construction of technological machines, intelligent control of technological complexes of equipment, the position of tribotechnics in the practice of equipment operation</i></p> <p><i>Be able to apply innovative and digital technologies in practice when solving situational problems in the above-listed areas.</i></p>
<p>Content</p>	<p><i>The description of the contents should clearly indicate focus areas and the level of difficulty.</i></p> <p><i>Fundamentals of the use of digital technologies in the design and construction of technological machines and equipment; Concepts and methods of digital technologies in the design and construction of technological machines and equipment; Digital technologies in the design of cast and machined parts. Design solutions for fixing axles and shafts of TM; Digital technologies in standard design solutions for the design and construction of technological machines and equipment; Digital technologies for the design of drives of technological machines; Concepts and tasks of digitalization of operational and service processes; Digitalization of installation of electrical and electromechanical equipment; Digitalization of the production process of repair of technological machines and equipment; Digitalization of methods for restoring parts of technological machines and equipment; Digitalization of control of technological complexes; Operation systems for a given resource and the condition of parts of assemblies and machines; Technologies and automation tools for energy saving during operation of technological machines and equipment; Indicators of energy efficiency and energy saving; The main directions of improving the energy efficiency of technological machines and equipment; Classification of methods for measuring the parameters of technological machines; Measurement of electrical quantities by analog devices; Methods for converting analog quantities into digital code; Measuring converters; Digital indicators; Systems for contactless transmission of analog and digital signals; Digital methods for measuring angle movements; Computer means for entering digital information; Classification of automated control systems for technological complexes of equipment; Structure of modern systems of automatic control of technological processes; Control systems for discrete processes of technological complexes; Mathematical models of technological objects of control of technological complexes; Automated control systems for technological complexes.</i></p>
<p>Exams and assessment formats</p>	<p><i>Exams for the module are conducted in writing. The exam ticket consists of 3 questions (theory, situational problems, calculations), each of which is allocated a certain amount of time and points at the discretion of the teacher, but the total time allocated to the student to provide an answer to the exam ticket should not exceed 120 minutes, and the maximum number of points is 40. And also the teacher adheres to the following assessment criteria:</i></p> <ol style="list-style-type: none"> <li><i>1. Accuracy – 35%.</i></li> <li><i>2. Completeness of the solution of the problem – 35%.</i></li> <li><i>3. Creativity and originality – 30%.</i></li> </ol>



<p>Study and examination requirements</p>	<p><i>Admission of students to the exam in the discipline is carried out automatically:</i></p> <ul style="list-style-type: none"> <li>- based on the assessment of the admission rating, determined by the results of the current and boundary control of academic performance (the total number of required semester points is at least 25 for two attestations);</li> <li>- those who have no outstanding tuition fees;</li> <li>- those who do not have more than 20% of skipping training sessions in the discipline;</li> <li>- not being on academic leave or academic break;</li> </ul> <p><i>those who do not have an overdue medical examination.</i></p> <p><i>The final assessment of the discipline includes assessments of current academic performance and final control. The assessment of current academic performance (admission rating) is 60% of the final assessment of knowledge in the discipline, the assessment of the exam is 40% of the final assessment of knowledge in this discipline. Thus, the final score for each discipline is determined as the sum of the points scored by the student according to the results of the current and boundary performance controls (rating - maximum 60 points, minimum 25 points) and the exam (final control - maximum 40 points, minimum 20 points), which together makes up a maximum of 100 points.</i></p>
<p>Reading list</p>	<ol style="list-style-type: none"> <li>1) Krivenko A. E. <i>Fundamentals of designing mining machines and equipment.</i> - M.: Moscow State State University, 2006</li> <li>2) Shelofast V. V. <i>Fundamentals of machine design.</i> - M.: APM Publishing House, 2005.</li> <li>3) Markova L. N. <i>Application of the principle of equal stress in the design of technological machines of underground mines. Proceedings of the international scientific and practical conference dedicated to the 100th anniversary of the birth of A. Zh. Mashanov-Almaty:KazNTU, 2007.</i></li> <li>4) Markova L. N. <i>Application of the principle of equal stress in the design of technological machines of underground mines. Bulletin of KazNTU-Almaty, KazNTU, 2007</i></li> <li>5) Balasheva Yu. V. <i>Optimal allocation of resources at the stage of development and control of design documentation // Izvestiya TulSU. Series. Business processes and business systems. - Issue 4. - Tula: TulSU Publishing House, 2012. - pp. 119-126</i></li> <li>6) <i>Energy-saving asynchronous electric drive // I. Ya. Braslavsky, Z. Sh. Ishmatov, V. N. Polyakov: Textbook.manual for students. higher. studies. institutions. - M.: Publishing center "Academy", 2004 – - 256 p.</i></li> <li>7) <i>Electric drive and automation of industrial installations as a means of energy saving / I. A. Averbakh, E. I. Barats, I. Ya. Braslavsky, Z. Sh. Ishmatov. - Yekaterinburg: Sverdlovgosenergonadzor, 2002. - 28 p.</i></li> <li>8) <i>Frequency-controlled asynchronous electric drive as a means of energy saving / I. A. Averbakh, E. I. Barats, I. Ya. Braslavsky, Z. Sh. Ishmatov // Energetika region. - Yekaterinburg, 2002. – №2(45). – P. 34-35.</i></li> <li>9) <i>Lazutkina N. A., Ignatov S. N., Lazutkin S. L. Energy balance of technological equipment // Modern high-tech technologies. - 2015. - No. 1. - p. 35.</i></li> <li>10) <i>Rathor T. S. Digital measurements. ADC / DAC.2006.</i></li> <li>11) <i>Tikhonov B. N., Khodzhaev I. A. Metrology and electrical and radio measurements in telecommunications systems. studies. manual / under the general editorship of B. N. Tikhonov – - 3rd ed., ispr. and add. - M.: Hotline-Telecom, 2017. - 398, p.</i></li> </ol>

Reading list	<p>12) Gavrilov A. N., Pyatakov Yu. V. <i>Means and systems of technological process control. Textbook. Publishing house: Lan, 2019. -376</i></p> <p>13) Trotsenko V. V. <i>Technological process management systems and information technologies textbook. - Moscow: Yurayt Publishing House, 2017. - 136 p.</i></p> <p>14) Kangin V. V., Kozlov V. N. <i>Hardware and software of control systems. Industrial networks and controllers: A textbook. -. M.: BINOM Publishing House, 2010, -418 p.</i></p>
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Module designation	<b><i>M-3. Practice-oriented module</i></b>
This block includes the following types of practice	6 credits - Pedagogical practice 4 credits - Research practice
Semester(s) in which the module is taught	<i>Spring (2,4)</i>
Person responsible for the module	<i>Bortebayev Saiyn Abilkhanovich</i>
Language	<i>Kazakh, Russian, English</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>Conducting experiments and methods of processing experimental studies. Methods of teaching special disciplines.</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 300 hours</i>
Credit points	<i>10</i>
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	<i>Consolidation of pedagogical skills in the educational environment (college, institute, university) and conducting research. Obtaining skills for conducting classes, using elements of interactive, distance learning.</i>
Content	<i>Passing of pedagogical practice in the conditions of an educational organization, conducting lectures, practical and laboratory classes. Passing of research practice in the conditions of scientific laboratories and the organization of the scientific and educational sphere.</i>
Exams and assessment formats	<i>Writing and protecting a report on the work done</i>
Study and examination requirements	-
Reading list	<p>1) <i>Methodological instructions for conducting research practice of undergraduates of the specialty 7M07111 - "Digital engineering of machines and equipment", KazNITU, 2020</i></p> <p>2) <i>Methodological instructions for conducting pedagogical practice of undergraduates of the specialty 7M07111 - "Digital engineering of machines and equipment", KazNITU, 2020</i></p>

Module designation	<b><i>M-4. Experimental research module</i></b>
The module consists of the research papers of the undergraduate, which he performs in each semester (4 semesters)	<p><i>2 credits - Research work of a master's student, including internship and completion of a master's thesis I</i></p> <p><i>3 credits - Research work of a master's student, including internship and completion of a master's thesis II</i></p> <p><i>5 credits - Research work of a master's student, including internship and completion of a master's thesis III</i></p> <p><i>14 credits - Research work of a master's student, including internship and completion of a master's thesis IV</i></p>
Semester(s) in which the module is taught	<i>Autumn, Spring (1,2,3,4)</i>
Person responsible for the module	<i>Bortebayev Saiyn Abilkhanovich</i>
Language	<i>Kazakh, Russian, English</i>
Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>theoretical and experimental research</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 720 hours</i>
Credit points	<i>24</i>
Required and recommended prerequisites for joining the module	<i>-</i>
Module objectives/intended learning outcomes	<p><i>The purpose of the module is to develop skills of working in a research environment.</i></p> <p><i>Willingness to work independently, the ability to manage your time, plan and organize activities.</i></p>

<p>Content</p>	<p><i>The scientific component of the educational program is formed from the research work of a graduate student, scientific publications and the writing of a master's thesis.</i></p> <p><i>The scientific work of undergraduates is organized directly at the graduate departments and/or in the scientific laboratories of the University, as well as at the leading enterprises of the industry.</i></p> <p><i>The results of research or BROADCAST at the end of each period of their passage are issued in the form of a report.</i></p> <p><i>The main results of the master's thesis should be presented in at least one publication and/or one presentation at a scientific and practical conference.</i></p> <p><i>All publications indicate the affiliation of the university – Satbayev University. The list of publications is approved by the academic Secretary of the University</i></p> <p><i>The final result of the research or experimental research work of a graduate student is a master's thesis</i></p> <p><i>Within the framework of research work (experimental research work), an individual master's work plan for familiarization with innovative technologies and new types of production provides for mandatory scientific internship in scientific organizations and/or organizations of relevant industries or fields of activity.</i></p> <p><i>Research internship is carried out in partner universities, in scientific organizations and/or organizations of relevant industries or fields of activity within the framework of an Agreement (Memorandum) about cooperation.</i></p>
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Exams and assessment formats	<p><i>To be sent for a research internship, a master's student must submit documents to an authorized structural unit no later than 4 weeks - Kazakhstan and the near abroad, 6 weeks - the far abroad - before the expected date of the business trip according to the following list:</i></p> <ol style="list-style-type: none"> <li><i>1) personal application addressed to the supervising vice-rector with visas of the supervisor, head of the department, director of the institute;</i></li> <li><i>2) submission of the director of the institute to the supervising vice-rector;</i></li> <li><i>3) a copy of an invitation letter for an internship from a university, a scientific organization and/or an organization in the specialty profile. A scientific internship program is attached to the invitation letter;</i></li> <li><i>4) the plan of the student's scientific internship, certified by the supervisor, the head of the department and the director of the institute;</i></li> <li><i>5) cost estimates (memo of the Director of the Institute).</i></li> </ol> <p><i>The results of research or experimental research work at the end of each period of their passage are issued by the undergraduate in the form of a report.</i></p> <p><i>At the end of the scientific internship, a student of postgraduate education must:</i></p> <ul style="list-style-type: none"> <li><i>- within three working days from the date of arrival, submit a report with supporting documents to the Department of Finance and Accounting;</i></li> <li><i>- within a week from the date of arrival, submit to a detailed report on the results of the internship in accordance with the approved internship plan, certified by the supervisor, the head of the department and the director of the institute.</i></li> </ul> <p><i>Attached to the report are:</i></p> <ul style="list-style-type: none"> <li><i>- a copy of the certificate (a document confirming the development of the scientific internship program);</i></li> <li><i>- extract from the minutes of the meeting of the department on the results of the master's scientific internship.</i></li> </ul>
Study and examination requirements	<p><i>Within the framework of research activities, the master's student conducts contract work with the supervisor on various types of work related to the study of the chosen scientific topic and the writing of the master's thesis, as well as performs ongoing monitoring of compliance with the master's calendar schedule of the master's thesis.;</i></p> <p><i>The supervisor sets the scope of all sections of the master's thesis and coordinates the work of the undergraduate.</i></p>
Reading list	<i>In the direction of research the topic of the dissertation</i>

Module designation	<b><i>M-5. Module of final attestation</i></b>
This block includes	<i>12 credits - Preparation and defense of a master's thesis</i>
Semester(s) in which the module is taught	<i>Spring (4)</i>
Person responsible for the module	<i>Bortebayev Saiyn Abilkhanovich</i>
Language	<i>Kazakh, Russian, English</i>

Relation to curriculum	<i>Mandatory</i>
Teaching methods	<i>theoretical and experimental research</i>
Workload (incl. contact hours, self-study hours)	<i>Total workload: 360 hours</i>
Credit points	<i>12</i>
Required and recommended prerequisites for joining the module	<i>Mastering all modules</i>
Module objectives/intended learning outcomes	<i>The purpose of the final certification is to evaluate the achieved learning outcomes and mastered competencies upon completion of the study of the Master's degree program.</i>
Content	<p><i>A master's thesis is a final qualifying scientific work, which is a generalization of the results of an independent study by a graduate student of one of the actual problems of a particular specialty of the relevant branch of science, having an internal unity and reflecting the progress and results of the development of the chosen topic.</i></p> <p><i>The Master's thesis is the result of the research /experimental research work of the undergraduate conducted during the entire period of the undergraduate's studies.</i></p> <p><i>The defense of a master's thesis is the final stage of master's degree preparation. The master's thesis must meet the following requirements:</i></p> <ul style="list-style-type: none"> <li><i>– the work must conduct research or solve current problems in the field of operation and repair of mining, metallurgical and oil and gas production;</i></li> <li><i>– the work should be based on the identification of important scientific problems and their solution;</i></li> <li><i>– decisions must be scientifically sound and reliable, have internal unity;</i></li> <li><i>– the dissertation work must be written alone;</i></li> </ul>
Exams and assessment formats	<i>The final certification is at least 12 academic credits in the total volume of the master's degree program of scientific pedagogical and profile directions and is carried out in the form of writing and defending a master's thesis (project)</i>

<p>Study and examination requirements</p>	<p><i>To receive the final certification from undergraduates, the university forms a Certification Commission (CC).</i></p> <p><i>The chairman of the commission is appointed a person with an academic degree of doctor or candidate of sciences, or a PhD degree / according to the profile corresponding to the profile of graduates, and not working in this organization.</i></p> <p><i>The composition of the CC in the specialties of the magistracy, as its members, includes persons with an academic degree of doctor and candidate of sciences, an academic degree of doctor PhD / in the profile and a master's degree corresponding to the profile of graduates (highly qualified specialists corresponding to the profile of graduates can also be included in the CC for the profile of the magistracy).</i></p> <p><i>Admission to the final attestation of undergraduates is issued by the order of the Rector according to the list no later than two weeks before the start of the final attestation and is submitted to CC.</i></p> <p><i>Verification of the project / dissertation works for borrowing without reference to the author and the source of borrowing (checking for plagiarism) is carried out in accordance with the state mandatory standards of postgraduate education of the magistracy.</i></p> <p><i>The defense of the project /dissertation works is carried out at the meeting of the CC.</i></p> <p><i>The defense of the master's project / dissertation is carried out in the presence of:</i></p> <ul style="list-style-type: none"> <li><i>- positive feedback from the supervisor;</i></li> <li><i>- at least one publication on the topic of the project/ dissertation in scientific publications or a speech at an international or republican scientific conference;</i></li> <li><i>- the decision of the graduating department on the recommendation for protection (extract from the minutes of the meeting of the department);</i></li> </ul>
<p>Reading list</p>	<p><i>In the direction of research the topic of the dissertation</i></p>