



# **ASIIN Seal & EUR-ACE<sup>®</sup> Label**

## **Accreditation Report**

**Bachelor's Degree Programme**

***Mechanical Engineering***

***Technological Machines and Equipment***

**Master's Degree Programme**

***Mechanical Engineering***

***Technological Machines and Equipment***

Provided by

**Satpaev Kazakh National Research Technical University**

Version: 29.09.2017

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## A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for <sup>1</sup>	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) <sup>2</sup>
Ba Mechanical Engineering (B.Sc.)	Mechanical Engineering	ASIIN, EUR-ACE® Label	AIOP/RAEE, 16.04.2010 – 16.04.2015	FA 01
Ma Mechanical Engineering (M.Sc.)	Mechanical Engineering	ASIIN, EUR-ACE® Label		FA 01
Ba Technical Machines and Equipment (by industry) (B.Eng.)	Technical Machines and Equipment (by industry)	ASIIN, EUR-ACE® Label	AIOP/RAEE2 2.03.2011 – 22.03.2016	FA 01
Ma Technical Machines and Equipment (by industry) (M.Sc.)	Technical Machines and Equipment (by industry)	ASIIN, EUR-ACE® Label	AIOP/RAEE2 2.03.2011 – 22.03.2016	FA 01
<p><b>Date of the contract:</b> 18.09.2015</p> <p><b>Submission of the final version of the self-assessment report:</b> 08.02.2016</p> <p><b>Date of the onsite visit:</b> 02.-03.03.2016</p> <p><b>at:</b> Burkitbayev Institute of Industrial Engineering, Baykonurov Mining and Metallurgical Institute</p>				
<p><b>Peer panel:</b></p> <p>Prof. Dr. Bernd Meyer, Jade University (Germany)</p> <p>Prof. Dr. Wolfgang Müller, Technical University of Berlin</p> <p>Prof. Dr. Jens Schuster, University of Applied Sciences Kaiserslautern</p>				

<sup>1</sup> ASIIN Seal for degree programmes; EUR-ACE® Label: European Label for Engineering Programmes

<sup>2</sup> TC: Technical Committee for the following subject areas: TC 01 – Mechanical Engineering/Process Engineering

Dr. Matthias Wunderlich, Robert Bosch GmbH

Luka Giorgadze (student peer), Karaganda State Technical University

**Representative of the ASIIN headquarter:**

Dr. Thomas Lichtenberg

**Responsible decision-making committee:** Accreditation Commission for Degree Programmes

**Criteria used:**

European Standards and Guidelines as of 15.05.2015

ASIIN General Criteria as of 28.03.2014

Subject-Specific Criteria of Technical Committee 01 – Mechanical Engineering/Process Engineering  
as of 09.12.2011

## B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF <sup>3</sup>	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Ba Mechanical Engineering	B.Sc.			Full time	/	8 Semester	129 RK credits=207-ECTS (theoretical education), with practices 247 ECTS	
Ma Mechanical Engineering	M.Sc.			Full time	/	4 Semester	42 RK credits=968 ECTS (theoretical education), with practices 94 ECTS	
Ba Technical Machines and Equipment (by industry)	B.Eng.	1. Mining machines and equipment 2. Metallurgical machines and equipment 3. Machines and Equipment Oil and Gas Industry		Full time		8 Semester	129 credits The Republic of Kazakhstan= 207-ECTS	Fall Semester 2001 / Fall Semester
Ma Technical Machines and Equipment (by industry)	M.Sc.	1. Mining machines and equipment 2. Metallurgical machines and equipment 3. Machines and Equipment Oil and Gas Industry		Full time		4 Semester	42 credits The Republic of Kazakhstan = 84 - ECTS	Fall Semester 2001 / Fall Semester

<sup>3</sup> EQF = The European Qualifications Framework for lifelong learning

For the Bachelor's degree programme Mechanical Engineering the institution has presented the following profile in the self-assessment report:

„The uniform goal of training of the Bachelor Mechanical Engineering program is the training of specialists for work in the field of mechanical engineering, having theoretical base according to the standard curriculum of specialty, practical skills of design of production, technological processes of production of the products of mechanical engineering owning set of means, ways and methods production and technological design, experimental and research, organizational and economic administrative activity and also it is structure - the design, directed on production competitive production of mechanical engineering on the basis of application of modern methods of calculation and design of samples of new equipment, devices, cars, designs and new materials, the solution of problems of dynamics, durability, reliability of mechanical systems “

For the Master's degree programme Mechanical Engineering the institution has presented the following profile in the self-assessment report:

„The purpose of the Master Mechanical Engineering is to provide quality profile and scientific-pedagogical education in mechanical engineering, training of specialists (Masters), capable of solving scientific problems of modern mechanical engineering, independently solve issues of designing, implementation and maintenance of new technological processes and machines.“

For the Bachelor's degree programme Technological Machines and Equipment the institution has presented the following profile in the self-assessment report:

1. “Study of the cycle of general disciplines for social and humanitarian education based on the laws of socio-economic development of society, history, modern information technologies, the state language, foreign and Russian languages.
2. Study of the cycle of basic disciplines to provide knowledge of the natural sciences, general technical and economic disciplines, as the foundation of vocational education.
3. Study of the cycle majors for the formation of theoretical knowledge and practical skills in technology machines and equipment mining and metals, oil and gas industry.
4. Study of disciplines forming the knowledge skills of planning and organization of research, design technologies and devices.
5. Introduction to the technology and equipment of factories and plants in the period of holding of various types of practices.

6. Acquisition of skills of laboratory research, technological calculations, equipment selection and design using modern computer technology and programs.”

For the Master’s degree programme Technological Machines and Equipment the institution has presented the following profile in the self-assessment report:

“In the field of experimental and research activities:

- Analysis of the problem of research in a given area on the basis of selection and study of literature and patent sources;
- Diagnostics of the state and dynamics of the objects of activity materials, processes, equipment in various industries with the necessary tools and methods of analysis;
- Study of the structure and properties of engineering materials, their improvement and development of new materials and processes for their manufacture;
- Construction of mathematical models computer modelling to solve the problem;
- Measurements and research in the development of new materials and technologies in mechanical engineering for a given procedure with a choice of modern technology and computer processing of the results;

In the area of the settlement and the design and analysis:

- The formulation of goals and objectives of the project (program) in the issued criteria, the objective function, constraints, the construction of the structure of their relationships, identifying priority problem solving;
- Development of generalized solutions to the problems, the analysis of these options, predict consequences, finding compromise solutions in a multicriteriality, uncertainty, planning and implementation of projects;
- The development of projects of engineering equipment based on mechanical, technological, design, performance, ergonomic, aesthetic and economic parameters;
- The use of information technology for the selection of materials and equipment needed in the manufacture of finished products;

In the field of industrial and technological activities:

- conducting physical and experimental studies using modern techniques for measuring and processing the results;
- the introduction of production processes, quality control of components and assemblies for different purposes;
- calculation of production standards, technological standards in the flow of materials, tools, selection of standard equipment, preliminary assessment of the economic efficiency of operations;

- the development of technical specifications for the construction of individual units devices, equipment and special tools;
- efficient use of materials and equipment selection and calculation of parameters of technological processes for the preparation of the finished product;
- standardization and certification of engineering equipment and processes and in their manufacture and repair;
- environmental control of production;
- participation in work on fine-tuning and development of technological processes in the manufacture of products of the process engineering industry sector;



## C Peer Report for the ASIIN Seal<sup>4</sup>

### 1. The Degree Programme: Concept, content & implementation

<b>Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)</b>
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**Evidence:**

- Mission Statement: <http://kazntu.kz/en/about-university/mission> (Access 15.03.2016)
- Learning objectives (only available in Russian)
  - <http://portal.kazntu.kz/files/speciality/5B071200.pdf> (Access 15.03.2016)
  - <http://www.kazntu.kz/sites/default/files/6M071200%20Машиностроение.pdf> (Access 15.03.2016)
  - <http://www.kazntu.kz/sites/default/files/6M072400%20Технологические%20машины%20и%20оборудование%20по%20отраслям.pdf> (Access 15.03.2016)
  - <http://portal.kazntu.kz/files/speciality/5B072400.pdf> (Access 15.03.2016)
- Diploma Supplement for each of the degree programmes
- Learning objectives according to the Self Assessment Report

**Preliminary assessment and analysis of the peers:**

The Burkitbayev Institute of Industrial Engineering of the Satpaev Kazakh National Research Technical University defined objectives and learning outcomes for the Bachelor and the Master programmes Mechanical Engineering. The same applies to the Baykonurov Mining and Metallurgical Institute which defined programme objectives and learning outcomes for the Bachelor and the Master programmes Technological Machines and Equipment. The peers could identify programme specific information on the webpage of the university; however the information is available in Russian and Kazakh only.

The peers examined the objectives and the learning outcomes of all four degree programmes in the light of the **Subject-Specific Criteria (SSC)** of the Technical Committee for

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<sup>4</sup> This part of the report applies also for the assessment for the European subject-specific labels. After the conclusion of the procedure, the stated requirements and/or recommendations and the deadlines are equally valid for the ASIIN seal as well as for the sought subject-specific label.

Mechanical Engineering and Process Engineering of ASIIN to assess if they reflect the level of academic qualification aimed at and are equivalent to the learning outcome examples described in the respective ASIIN Subject-Specific Criteria. The peers came to the following assessment:

For the Bachelor degree programme Mechanical Engineering the peers confirmed that *extensive technical knowledge as to engineering, mathematics and natural science* with a view to mechanical engineering shall be achieved. The peers assume that this is expressed in the objective that “the students have a theoretical base according to the standard curriculum of specialty”. This is supported by the objective that students shall obtain “practical skills of design of production, technological processes of production of the products of mechanical engineering including a set of means, ways and methods for production and technological design”. The peers could comprehend that competences in the field of *engineering analysis* are aimed at. Aspects of *engineering design* are also covered from the peer’s point of view as it is stated in the programme objectives that students shall be competent in “design, directed to competitive production of mechanical engineering”. Additionally, the students learn the basis of application of modern methods of calculation and design of samples of new equipment, devices, cars, designs and new materials”. Furthermore, students shall “have the motivation to learn throughout the whole life, have the skills of independent learning and skills development and shall be specialists for research activities in the field of mechanical engineering”. The peers agreed that competences in the field of *investigation and assessment* are covered. Students shall also acquire “practical skills in designing and technological processes of engineering production (blanking, machining and machine assembly), mathematical processing of research results, and preparation of technological processes using modern information technologies”. Students shall also obtain transferable skills like “have an idea about the main directions in the field of humanitarian and socio-economic sciences, analyze socially significant problems and activity processes. Students shall have communication skills, be a good team player, adapt to changes and promote social cohesion”.

The peers welcomed the efforts of the Department to refer to the Dublin descriptors level two when describing the learning outcomes of the Master programme Mechanical Engineering. The peers understood that students shall be “capable of solving scientific problems of modern mechanical engineering, and independently solve issues of designing, implementation and maintenance of new technological processes and machines.” Additionally, the students shall “deepen the theoretical and practical individual training of undergraduates in engineering” and obtain the “ability to apply knowledge, understanding and ability to solve problems in new or unfamiliar situations in the interdisciplinary areas related to the field of mechanical engineering”. *Engineering practice* shall be ac-

quired through the competence to “apply scientific methods of knowledge in professional activity and to critically analyze existing concepts, theories and approaches to the study of processes and phenomena”. The principles of scientific work are covered in the objective that students “carry out information-analytical and information-bibliographical work using modern information technologies and summarize the results of experimental research and analysis in the form of a dissertation, scientific publications in the form of articles or reports”. Transferable skills shall also be obtained like “psychological methods and means to improve the efficiency and quality of education” or graduates shall be able “accurately and clearly tell conclusions, knowledge and their justification to experts and non specialists”.

The peers acknowledged that the programme objectives and learning outcomes of the Bachelor Technological Machines and Equipment had been elaborated over a number of pages. The peers saw key competences of the field of *knowledge and understanding* of the ASIIN subject specific criteria covered as students shall “study the cycle of basic disciplines to provide knowledge of the natural sciences, general technical and economic disciplines, as the foundation of vocational education”. Competences in the field of *engineering analysis* are aimed for in the objective that students “study the cycle majors for the formation of theoretical knowledge and practical skills in technological machines and equipment particularly from the mining and metals, oil and gas industry”. Furthermore, the students “study disciplines and aim at the knowledge and skills of planning and organization of research, design technologies and devices”. *Engineering design* is also covered from the peer’s point of view as students shall gain an “introduction to the technology and equipment of factories and plants in the period of holding of various types of practices” and they acquire “skills of laboratory research, technological calculations, equipment selection and design using modern computer technology and programs”. Transferable skills are covered in a broad set of competences like the “ability to criticism and self-criticism”, the “ability to work in a team or to perceive the diversity and cultural differences”, and “the ability to work in an international context”.

For the Master Technological Machines and Equipment the peers understood that consolidated *knowledge of mathematic-scientific and engineering* principles of mechanical engineering shall be obtained as expressed in “construction of mathematical models computer modelling to solve the problem” or students shall “study the structure and properties of engineering materials, their improvement and development of new materials and processes for their manufacture”. Competences in the field of *engineering analysis* shall also be acquired as students shall learn “measurements and research in the development of new materials and technologies in mechanical engineering for a given procedure with a choice of modern technology and computer processing of the results”. Fur-

thermore, students shall learn “the development of projects of engineering equipment based on mechanical, technological, design, performance, ergonomic, aesthetic and economic parameters” or “designing process control programmes to create new metals and mining and oil and gas machines and equipment”. The peers could comprehend that students shall learn the principles of *engineering design*. Engineering Practice shall be gained as the learning objectives state that students shall “conduct physical and experimental studies using modern techniques for measuring and processing the results” or “be introduced of production processes, quality control of components and assemblies for different purposes”. Transferable skills are elaborated in some detail like students shall “be able to adequately orient in different social situations”, “be able to work in a team and defend their point of view”, and “to strive for professional and personal growth”.

The peers confirmed that the subject specific criteria of ASIIN are covered in the learning objectives of all four degree programmes under review. Furthermore, the University applied for the EUR-ACE® (European Accredited Engineer) Label. The EUR-ACE® Label is a quality certificate for engineering degree programmes and is recognized Europe-wide. During the accreditation process, the reviewers verified whether the engineering degree programs comply with the criteria fixed in the EUR-ACE Framework Standards. The Subject-Specific Criteria (SSC) of the Technical Committee for Mechanical Engineering and Process Engineering are closely linked to the EUR-ACE Framework Standards; consequently, the analysis of the Subject-Specific Criteria encompasses the EUR-ACE Framework Standards. The peers confirmed that the EUR-ACE Framework Standards regarding the intended learning outcomes are fulfilled for the First (Bachelor) and Second (Master) Cycle Degree Programmes in line with the Bologna Declaration.

However, the description of the learning objectives of all four degree programmes expand over several pages; even though content-wise the learning objectives correspond to the subject-specific criteria of ASIIN as outlined before, the learning outcomes as presented in the two reports contain a number of redundancies and vague formulations like “providing a holistic perception of the world picture” or “development of the most important and sustainable knowledge”. The peers highlighted that the given learning objectives do not provide a concise qualification profile of Mechanical Engineering or Technological Machines and Equipment. As the learning outcomes are intended to deliver a clear and understandable abstract of the qualification profile to students and interested stakeholders, the peers underlined that the educational objectives/learning outcomes should be revised to become more concise and describe in a focussed manner the academic, subject-specific and professional classification of the qualifications gained in the degree programme. Additionally, given the fact that KazNRTU states in its mission statement that it “prepares graduates to compete in a diverse world market” and “wants to partner with

other universities” the peers underlined that all relevant information for the degree programmes should be available in English, too.

KazNRTU explained that the programme objectives and learning outcomes are developed within the respective departments but then presented to external stakeholders like business partners for their feedback. KazNRTU underlined that external stakeholders have only an advisory role but their comments are being taken into consideration. The business representatives confirmed that they maintain close cooperation with the university and are consulted frequently with regard to the quality of different degree programmes. KazNRTU further explained that the learning objectives of the programmes as well as the curriculum are being revised and updated annually depending on the feedback from the scientific council and the labour market. The peers acknowledged that relevant stakeholders were included in the process of formulating and further developing the objectives and learning outcomes.

Some of the business representatives confirmed that they offer places for internships to students which requires a steady contact with the university. They also underlined that they try to employ graduates if they performed to their satisfaction. The peers understood that the intended qualification profile allows the students to take up an occupation which corresponds to their qualification.

### **Criterion 1.2 Name of the degree programme**

#### **Evidence:**

- Overview of Degree Programmes
  - <http://kazntu.kz/en/educational/arriving> (Access 15.03.2016)
  - <http://www.kazntu.kz/en/node/2098> (access 15.03.2016)

#### **Preliminary assessment and analysis of the peers:**

The peers discussed the programme names and concluded that the programme names properly reflect the intended aims and learning outcomes.

### **Criterion 1.3 Curriculum**

#### **Evidence:**

- Sequence of modules for each degree programme
- Self-assessment report, chapter 1.3

- Module descriptions provided by the university
- Interviews during the audit with programme coordinators, lecturers, business representatives and students

**Preliminary assessment and analysis of the peers:**

The auditors assessed the curricula of the programmes under review against the programme objectives provided in the self-assessment report as well as against the stipulations of the Subject-Specific Criteria. The peers received an overview of the sequence of modules for the different degree programmes; the overall objectives and intended learning outcomes for the degree programme are systematically substantiated and updated in its individual modules. The module descriptions are examined in more detail under criterion 5.1. However, the university has not provided the full set of module descriptions. The peers welcome the efforts of the university to translate the syllables into English but they underline that they require a full set of module descriptions to be able to fully judge the content of the curricula. The peers request the missing module descriptions in English. Some module descriptions still contain Russian components which also need to be translated. Additionally, a module-objective matrix which depicts the curricular implementation of the intended learning outcomes had not been provided for all degree programmes which made it difficult for the peers to fully comprehend if the content of the study programmes corresponds fully to the learning outcomes. The auditors took note of the fact that the curriculum of all programmes contains modules like “History of the Republic of Kazakhstan”, “Physical Training”, or “Kazakh/ Russian language” which are mandatory by state regulation and have to be understood in the specific context of the country. The peers considered the amount of “general studies” quite high but concluded that it was still acceptable.

The Bachelor Technological Machines and Equipment (by industry) and the Master Technological Machines and Equipment (by industry) offer three so-called educational paths like 1. Mining machinery and equipment, 2. Metallurgical machinery and equipment, and 3. Machinery and equipment of petroleum industry. The peers wondered if the large number of elective modules still ascertains that the intended learning outcomes are being reached. The university clarified that basic engineering courses have to be taken by all students regardless of their educational path to make sure that key competences for this profession are being obtained by all students.

As outlined under criterion 1.1, the auditors could see that the intended learning outcomes are reflected in the learning outcomes which are in line with the Subject-Specific Criteria (SSC) of the Technical Committee for Mechanical Engineering and Process Engineering. The peers based their assessment, if the curricula of the different degree pro-

grammes are designed in a way to achieve the intended learning outcomes, on the information available, namely the module descriptions as far as they were available. The full analysis of the curriculum will only be possible when all module descriptions will have been made available.

In the Bachelor programme Mechanical Engineering, the students are supposed to obtain *competences in the field of knowledge and understanding* in modules like “Mathematics I, II, III”, “Physics I, II”, “Chemistry I, II”, “Informatics”, and “Applied Mathematics”. It is also plausible for the peers that *competences in the field of engineering analysis* and problem solving are taught in modules like “Theoretical mechanics”, “Analytical mechanics”, “Strengths of materials”, “Mechanics of materials”, “Technological processes of engineering production”, “The equipment of machine-building manufacture”, “Metal cutting machines” and “Cutting theory”. *Competences in the field of engineering design*, the ability to conceive the design of complex machinery, are supposed to be acquired in modules like “Equipment and tool designing”, and based on the electives selected additional designing competences are obtained in modules like “Bases of designing of sites”, “Design principles of engineering production”, “Automation of design and technological designing”, “Finite elements”, or “Finite element calculation of design”. Based on the information available the peers gained the impression that designing skills are being obtained but this needs further verification in the light of the still missing module descriptions.

For the Bachelor programme Technological Machines and Equipment the peers could understand that the students were supposed to gain a *broad and sound knowledge in mathematics, science and engineering* in modules like “Mathematics I and II”, “Physics I and II”, “Chemistry”, “Electrical Engineering”, “Strength of Materials” or “Standardization, certification, and metrology”. Competences in the field of *engineering analysis and problem solving competences* are supposed to be obtained in modules like “Applied Physics”, “Applied Mechanics”, “Technology mining works”, “Manufacturing technology of technological machines”, “Internal combustion engines”. When it comes to *competences in engineering design* the peers could comprehend that some modules are designed in a way to provide respective competences. The module “Technical diagnostics”, for example, teaches the student to use methods of carrying out experiments with the use of diagnostic devices. Or the purpose of “Reliability of technological machines” is to develop students' knowledge and skills and providing a creative approach to solving problems of reliability and durability of machines and technological equipment. Additionally, the module “Basic of construction and machine details” and “projection and designing of technological machines” are dedicated to develop the engineering construction competences. More subject specific *engineering design* modules are part of the electives focusing on one of

the three specialties. In summary, the peers confirmed that the curriculum contains modules to develop competences in the field of engineering design.

The requirements of engineering practice apply to both bachelor programmes alike. Engineering practice is supposed to be acquired in the “Industrial introductory placement” (5 ECTS credit points), the “Industrial practice” (5 ECTS credit points), and the “pre-diploma practice”. The “Industrial introductory placement” can be carried out in third-party companies (mining and metals, oil and gas companies in various fields, industrial associations) or at the Department and in the laboratories of the university. The purpose of this practice is to introduce the students to the process of mining and metallurgical and oil and gas production, tools, equipment, and the organization of production. The “Industrial practices” shall take place in a company (production, research, design). The purpose of this practice is to familiarize the students with the peculiarities of technological processes of industry, to prepare them for the study of relevant disciplines and to implement their own projects according to the course subject. The students are given tasks they have to fulfill during the practice, have to submit a report and make a final presentation. The “Pre-diploma practice” aims at deepening the students' knowledge in certain industrial fields depending on their specialty. The business representatives confirmed that they maintain close cooperation with the university and offer places for the practices. A number of graduates had been employed in the past and the companies support the university to develop professionals they may employ in future. The peers could see that *engineering practice* was well developed in the curriculum and concluded that the bachelor students are properly prepared for the demands of the labour market.

When examining the curriculum of both Master programmes, the peers noticed that more general modules like “Psychology”, “History and philosophy of science” or “Pedagogy” have to be taken by the students. The peers understood these modules as compulsory required by state legislation. The peers asked why a “Pedagogical practice” was foreseen in the curriculum of both Master programmes and learnt that this was a mandatory governmental regulation to prepare all students to be able to take on teaching obligations; some students wanted to become teachers and were hereby introduced to pedagogical practical teaching experiences. The peers accepted this explanation.

When looking more specifically at the Master Mechanical Engineering in the light of the subject specific criteria of the Technical Committee of ASIIN, the peers had been wondering where *consolidated knowledge of mathematic-scientific and engineering principles* of mechanical engineering was taught. After examining the final theses in detail the peers confirmed that advanced mathematical competences are evident and underlined that sufficient mathematical principles are included in the curriculum. The peers understood that competences in the field of *engineering analysis* should be obtained in modules like



“Qualitmetry in mechanical engineering”, “Methods of maintenance of reliability of the machine building equipment” or “Reliability and diagnostics of technological systems”. Competences in *engineering design* were included in modules like “Design and manufacture of instrumental equipment”, “Modeling and design of machine tools”, “Design of experiments” or “Optimal design” as the peers confirmed.

The Master programme Technological Machines and Equipment contains a number of modules like “Mathematical methods in engineering” or “Calculation of design value of mining and transportation machines and stationary equipment” which provides an advanced knowledge of *mathematic-scientific and engineering principles* as the peers comprehended. The peers understood that competences in the field of *engineering analysis* should be obtained in modules like “Scientific problems of creation of technological machines and facilities”, “Theoretical bases of design and construction of mining machines and systems of management” or “Repair and maintenance services of mining machines and systems of management”. Competences in the field of *engineering design* should be acquired in modules like “Theoretical bases of design and construction of mining machines and systems of management” or “Methodological principles and solutions for design of mining machines and stationary equipment” as the peers confirmed.

The peers could see for all degree programmes that a number of modules serve the purpose to obtain transferable skills like “Political sciences”, “Fundamentals of law”, “Sociology”, and “Culturology”. The lecturers also explained that they apply group work tasks where students are requested to resolve given problems jointly. In addition, there exist a number of professional clubs where students communicate with each other. The peers fully support these efforts but they have the impression that these managerial skills are taught comparatively late in the study programme. They recommended to provide more managerial skills (time/ project management, looking for scientific sources, problem solving strategies) at the beginning of the studies to make the independent work more effective.

As indicated above, the judgement of the peers was based on the module descriptions as far as they were available; a full set of English module descriptions is required to complete the assessment of the peers.

<b>Criterion 1.4 Admission requirements</b>
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**Evidence:**

- Information about the rules and regulations for admission can be found under following websites:

- <http://talapker.kazntu.kz/en/node/634> (Access 15.03.2016)
- <http://talapker.kazntu.kz/en/node/633> (Access 15.03.2016)
- <http://talapker.kazntu.kz/en/node/659> (Access 15.03.2016)
- <http://talapker.kazntu.kz/en/node/746> (Access 15.03.2016)
- Bachelor programmes: Decree of the Government of the Republic of Kazakhstan No.111 dated January 19, 2012
- Master programmes: Decree of the Government of the Republic of Kazakhstan No.109 dated January 19, 2012

### **Preliminary assessment and analysis of the peers:**

The peers confirmed that the requirements and admission procedures are accessible to all students on the websites; however, the link of the “rules of admission” leads to a pdf-file in Russian only. Given the ambition of Kazakh National Research Technical University (KazNRTU) the peers strongly recommended making all study relevant information including the admission rules and requirements available in English too. The auditors discussed the admission rules and procedures with the university representatives. The programme coordinators explained that the selection of the applicants for the Bachelor programmes is made by the Ministry of Education and Science; more specifically, admission for the bachelor degrees is carried out by the admission rule developed by the Ministry of Education and Science of Kazakhstan based on the Decree of the Government of the Republic of Kazakhstan No.111 dated January 19, 2012. Theoretically, any persons having general secondary (secondary general), technical and vocational (primary and secondary vocational, post-secondary), higher (higher vocational) education can be admitted to KazNRTU. It was further explained that educational grants are awarded to students on a competitive basis in accordance with gained scores on the Common National Testing (CNT) or complex testing. This Common National Testing is being taken by all high school graduates and the score received qualifies a high school graduate to apply for university admission. The Ministry of Education and Science defines the quantity of Educational Grants for each academic degree programme. The peers asked why there is a drastic decline in the number of admitted students from 2011 to 2012 and the following years and learnt that the score of the Common National Testing had been increased from 50 to 70 points; additionally, the demographic change taking place at Kazakhstan presently also had an impact on the number of new students. Altogether, the auditors judged that the admission requirements were reasonable for maintaining the quality of the Bachelor degree programmes.

The admission to Master degree programmes is based on the Rules for admission to professional educational programmes of postgraduate education at the KazNRTU which are

developed in accordance with the Law of the Republic of Kazakhstan “On education”, “Standard rules for admission to educational organizations implementing professional educational programs of postgraduate education” approved by the Decree of the Government of the Republic of Kazakhstan No.109 dated January 19, 2012. Educational grants for Master degree programmes are awarded to students on a competitive basis. Bachelor graduates have to take entrance exams which comprise a Foreign Language Test and a Programme Based Written Exam. The peer group concluded that this was an appropriate approach to secure the quality of the academic standard.

International students can apply for the Higher Education Institutes by taking the complex test (Bachelor degree) and university entrance exams. Presently, three citizens from Vietnam are studying at KazNRTU. The official language of study is Russian but some basic courses are offered in English. Foreign students are supposed to take one year course of Russian but there are some special agreements between countries. There is a governmental agreement between Kazakhstan and Germany, for example, which says that if there is one student from Germany, the whole educational programme could be taught in English. The peers concluded that the specific requirements and needs of foreign students are taken into consideration when applying at KazNRTU.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 1:**

The peers thanked KazNRTU for revising the programme objectives and the learning outcomes. They confirmed that the programme objectives and learning outcomes for each programme had been shortened and made far more concise than it had been in the original version. When studying the learning outcomes the peers concluded that they still contain the key elements relevant for the four degree programmes. Hence, in principal they assessed them as satisfactory although they underline that they are of different quality. The peers particularly welcomed the fact that some of the learning outcomes are being presented in a taxonomical differentiation. The peers recommended to further developing the learning outcomes applying the taxonomical classification. However, the peers cannot see that the educational objectives and learning outcomes have been published in English on the website and underline that the qualification objectives and other programme relevant information have to be accessible in English for all relevant stakeholders.

The peers positively noted that objective-module matrices had been submitted by the University that provide a clear overview which modules are supposed to achieve the corresponding learning outcomes. However, the peers critically noted that the goals in the table do not fully correspond to the revised educational objectives and learning outcomes

that had also been submitted to the peers. The peers also acknowledged that the module descriptions had been made available to the peers; however the peers still have considerable problems to understand the modules as they had been submitted in separate files and without proper naming. The peers highlighted that the module descriptions need to be revised and submitted in one file ideally with a table of contents. Additionally, the peers confirmed the recommendation to provide more managerial skills (time/ project management, looking for scientific sources, problem solving strategies) at the beginning of the studies to make the independent work more effective. The peers confirmed that the admission requirements are transparent and clearly defined. Except for the limitations that had been indicated in this section, the peers see this criterion fulfilled.

## 2. The degree programme: structures, methods and implementation

### Criterion 2.1 Structure and modules

#### Evidence:

- Module descriptions (as far as available)
- Curriculum / content overview
- Discussions with students and teaching staff

#### Preliminary assessment and analysis of the peers:

The peers confirmed that all degree programmes had been divided into modules and that each module comprised a sum of teaching and learning. According to the peers, the modularisation and structure of the curricula allow for the completion of the degree programmes in time. The peers also acknowledged that with its choice of modules, the structure ensures that the learning outcomes can be reached and allows students to define an individual focus and course of study.

The auditors welcomed the aim of KazNRTU to become a more international university and to foster cooperation with international partner institutions. From a practical point of view, the peers noticed that none of the students who participated in the discussion with the peers had been abroad even though many students indicated a vivid interest to study at another university. The students admitted that the requirements to qualify for an exchange programme were very difficult to meet. In addition, Kazakhstan is not included in the European Erasmus programme. Sometimes companies provided scholarships to students to study abroad. The peers concluded that opportunities to study abroad were

available and the selection process seems to be fair and transparent; but as there are few places available only a small number of students had a chance to really benefit from these opportunities. In order to realize the vision of KazNRTU to become an internationally recognized institution of Higher Education, the peers recommended to increase the number of international exchange programmes and to offer more opportunities to students to participate in these exchange programmes. As for the recognition of qualifications gained from other institutions of higher education, in particular abroad, grades, credits and content of modules are taken into consideration. There is a specific reference made by the regulations to the qualifications or competencies to be recognized. According to the Lisbon Convention each university is asked to recognize activities completed externally unless the HEI can prove that the competencies gained at the other HEI are completely different.

The auditors verified that modules taught at undergraduate level were not part of the curriculum in the Master's degree programmes.

The workload is being discussed in more detail under criterion 2.2. The peers gained the impression that the curriculum is structured in a way to allow students to complete the degree without exceeding the regular course duration.

### **Criterion 2.2 Work load and credits**

#### **Evidence:**

- Self Assessment Reports, chapter 2.2
- Curricular structures
- Module descriptions
- Discussions with students and teaching staff

#### **Preliminary assessment and analysis of the peers:**

The peers understood that KazNRTU has developed a credit system; according to this credit point system one credit point corresponds to one hour of lecture, one hour of structured learning with the teacher and one hour of independent work. KazNRTU turned the Kazakh credit points into the European Credit Transfer and Accumulation System (ECTS) to be able to compare the study attainment and performance of students of higher education with other European countries. When looking at the module descriptions the peers had difficulties to fully comprehend the workload calculation. In some cases abbreviations were used (e.g. ISW, ISWLT) unknown to the peers and the workload calculation

is presented in different, inconsistent ways. The peers asked the students if they felt that the actual workload and the ECTS –credits awarded to a module corresponded well and if there were any means to verify this calculation. The students explained that in most cases the workload and ECTS points corresponded more or less but there were modules like some of the general ones, which required less effort. According to the students no methods of verification were applied. The peers underlined that it should be verified that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions consistently and understandably.

The peers compared the workload of the different years and concluded that the number of ECTS points fluctuates around 30 credit points per semester which means a fairly balanced workload for the students. The peers confirmed that no structure related work peaks existed which was also confirmed by the students.

### **Criterion 2.3 Teaching methodology**

#### **Evidence:**

- Self Assessment Reports, chapter 2.3
- Module descriptions
- Discussions with students and teaching staff

#### **Preliminary assessment and analysis of the peers:**

The peers studied the module descriptions to understand the teaching methodology which is being applied. The module descriptions differentiate between “lecture”, “laboratory work”, and “practical work” supplemented by homework which has to be done individually or in groups. The peers welcomed that most modules consist of lectures and have a practical and laboratory component. The peers wanted to know how the laboratory and the practical work are being carried out, and the lecturers explained that they applied traditional methods like lectures with new teaching methods which included critical discussions with different roles (role games) or multimedia devices. Additionally, the students are given tasks they have to fulfil in groups where managerial and team working skills are being obtained. The peers judged these different teaching methods positively and underlined that this should also be indicated in the module descriptions. At the moment, the module descriptions do not provide any information about innovative teaching methods as indicated by the lecturers. Besides, the peers recommended to provide more managerial skills (time management, looking for scientific sources, problem solving strat-

egies) at the beginning of the studies to make the independent work more effective as indicated under criterion 1.3. Additionally, the peers could hardly find complex projects in the curriculum or the module descriptions where students are required to apply multidisciplinary approaches to be able to complete the task. The peers highlighted that from their point of view complex projects, where students have to work creatively and in interdisciplinary teams to resolve a task successfully, are very worthwhile didactical approaches, and they recommended that KazNRTU should consider to increase the amount of project based student tasks.

Furthermore, the peers understood that the university intends to make its programmes more international but except for the foreign language courses the students have hardly an opportunity to practice their English. The peers noticed that the competence to speak English was very diverse among the students. The students also indicated that they would like to have more technical oriented components in English. The peers underlined that it would be worthwhile to encourage staff members to offer English modules to enhance their own language competences and to also ask the students to make English presentations, submit English reports or use English documents. This would help to foster the oral and written language competences.

#### **Criterion 2.4 Support and assistance**

##### **Evidence:**

- <http://www.kazntu.kz/en/node/1351> (Access 15.03.2016)
- Self-assessment report, chapter 2.4
- Discussions with students and teaching staff

##### **Preliminary assessment and analysis of the peers:**

The peers learnt that for each degree programme students are divided into groups of 4 to 20 students and each group of students has its own advisor. Academic advisors are lecturers and professors of the university. The task of the academic advisor begins during the freshman year and continues throughout to the senior year. When starting the study programme, first-year students receive a Students' Guideline which contains all relevant information about the educational process of the credit system, structural units of the university, general requirements to the students, their rights and obligations, main provisions of monitoring and evaluation of students' knowledge. The academic advisor provides academic advice in terms of courses to be selected; additionally, the academic advisor also supports students regarding personal matters. The students confirmed that the academic advisors were very supportive and tried to assist the students in all matters.

Additionally, the university collects information about the students' academic progress at each stage, their current level of knowledge, the rating score of students' performance, and the tendency of their academic progress. This system allows the university to identify students falling behind immediately and take necessary action where this deems necessary. The website also provides a number of additional counselling and advisory services that can be used by the students. The auditors could see that sufficient resources were available for offering individual support, supervision and advice to students.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 2:**

The peers noticed that KazNRTU wanted to provide an overview of students who had actually benefitted from international mobility programmes but the peers were unable to find this document. Additionally, the peers are aware that student mobility is taking place but to a small extent only. The peers are aware that formally a number of international partner institutions exist but hardly any practical exchanges are taking place. That is why the peers stick to their recommendation to further develop international exchange programmes and to offer more opportunities to students to participate in these exchange programmes. The peers acknowledged that the module descriptions had been reworked and contain a clear breakdown of workload distinguishing between contact time and time for self learning. However, the overall calculation is still incorrect and needs to be rectified. Moreover, the peers still cannot comprehend that there is any kind of verification that the awarded ECTS-credits for the modules correspond to the actual workload of the students. Hence, the peers stick to their intended requirement. The peers gratefully received the explanation of project related teaching methods and welcome this approach. They encouraged KazNRTU to further pursue this approach and stick to their intended recommendation. The peers also appreciated the indication of KazNRTU to introduce more English modules in technical fields and stick to their recommendation to follow up at the re-accreditation how this will have been implemented. By the same token, the peers stick to their recommendation to offer more international exchange programmes and opportunities for students to participate in international exchanges. Additionally, also staff members should be offered more opportunities to enhance the English speaking and writing skills. Beside the mentioned fields of improvement the peers confirmed that this criterion is fulfilled.

### **3. Exams: System, concept and organisation**

<b>Criterion 3 Exams: System, concept and organisation</b>
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**Evidence:**

- Module descriptions
- Self-assessment report, chapter 3
- Discussions with students and teaching staff

**Preliminary assessment and analysis of the peers:**

The peers were told that examination rules and regulations are in place but they have not been forwarded to the peers yet. The peers kindly ask to submit the examination rules and regulations as additional information. The peers studied the module descriptions and noticed that in most module descriptions the final form of examination was mentioned. However, during the discussion with the lecturers and the students the peers had been told that a “continuous assessment approach” is applied which means that after about 8 weeks a first examination is taking place, a few weeks later a second control needs to be performed by the students and finally, there is the final examination. In principal, the peers are in favour of a continuous assessment as it allows students to balance a bad mark and it forces the students to consistently learn during the semester. However, the exact forms and their weighing factors for the final mark need to be communicated in a transparent way, as the peers emphasized. The module descriptions need to be adjusted accordingly. The exact dates of the examinations are communicated at an early stage during the semester and the students confirmed that they have sufficient time to prepare for them. The students underline that if a continuous work ethic is being applied the examinations can be performed successfully. At the end of the semester the students have to take six to seven examinations over a period of three weeks. The peers judged this as an appropriate workload. From the third semester onwards the students have also to perform oral examinations which comprise 40 to 60% of all examinations. The peers understand that oral skills are being developed in the different degree programmes; however, this is not properly indicated in the module descriptions either. The peers analysed the examinations as far as this was possible due to language barriers and gained the impression the examinations are devised to individually measure to which extent students have reached the learning outcomes defined. The peers understood that the number of students failing an examination was fairly small; nevertheless students have the right to appeal against a decision and may apply to retake an examination. Students with handicaps may receive individual and compensational treatment to accommodate them accordingly.

The students confirmed that according to their judgement, exams are marked using transparent criteria and the timeframe for marking exams does not interfere with indi-

vidual academic progression which means that students can directly move on from the bachelor's to the master's degree programme.

The Bachelor students have to carry out a so-called pre-degree practice of 13 ECTS credit points and the final project including the defence of 7 ECTS credit points. The same applies to the Master students who have to do research work and write the master thesis afterwards. It was explained to the lecturers that the pre-degree practice/research work should deepen the students' knowledge in accordance with the graduation assignment. The students have to identify a research topic themselves which must be approved by the university supervisor and the company where the practice is conducted. During the pre-degree practice the students collect relevant data at the companies for the final thesis; the final thesis is written at the university afterwards. Sometimes companies even offer scholarships for certain topics and many graduates find immediate employment in the company they have worked in after graduation. The peers examined the final theses as far as they could and confirmed that the thesis ensures that students work on a set task independently and at the level aimed for; the peers emphasized particularly the strength in mathematical analysis.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 3:**

In principal, the peers had the impression that the entire examination procedure was well organised; however, even though it can be assumed that proper rules and regulations are in place, the peers never had a chance to look at them. Hence the peers request that KazNRTU makes the respective rules and regulations available.

## 4. Resources

<b>Criterion 4.1 Staff</b>
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**Evidence:**

- Analysis of needs and capacities
- Staff handbook
- List of and information about research projects in the self-assessment report
- Article 52 of item 8 of the Kazakhstan Republic Law "About education of 27.07.07"

**Preliminary assessment and analysis of the peers:**

The peer group studied the staff handbook and concluded that the composition of the teaching body was able to ensure that the intended learning outcomes are achieved by the time the degree is completed. Sometimes also guest lecturers from industrial partners offer lecturers to give the students first hand information of labour market developments. Additionally, foreign guest lecturers are invited regularly and hold English lectures. Regarding the recruitment of staff members the auditors gained the impression that a competitive selection procedure was carried out to recruit university lecturers from other institutions of Higher Education or from private companies. Based on Kazakh law, the total number of teaching staff is calculated based on the average ratio of students and teachers (the average number of students per teacher) 8/1. The peers confirmed that there are sufficient staff resources available for providing assistance and advice to students and to fulfil administrative tasks; given the recent numbers of student enrolments the teaching situation becomes even more favourable.

The auditors noticed that both self-assessment reports provided a detailed overview of the research activities carried out in the last years; the funds are coming from governmental institutions, private companies and international institutions. KazNRTU highlighted that research funding is playing an increasingly important role with regard to the overall budget of the university and the upgrading of research equipment. Bachelor as well as particularly Master and PhD students were actively involved in the research projects. However, when looking at the staff handbook and the research conducted by the lecturers, the peers noticed that the research work focused on the shoulders of a few staff members while many staff members did not indicate any recent research projects. The staff members also admitted that the number of publications in journals with an international impact factor had not reached the amount that had been aimed for. When asking why research activities are not being implemented by more staff members the peers learnt that time limitations had been a crucial factor, even though the teaching load could theoretically be reduced if the teaching was secured otherwise. In summary, the peers gained the impression that the environment for research activities was not conducive and attractive incentives were lacking. That is why the peers recommended making the environment for research activities more conducive and encourage staff members to get more actively involved in research activities.

<b>Criterion 4.2 Staff development</b>
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**Evidence:**

- Self Assessment Report, chapter 4.2
- Capacity development offers / Further education
- Discussion with lecturers

**Preliminary assessment and analysis of the peers:**

In line with the Strategy 2020 of KazNRTU and on the basis of Plans developed by all structural divisions of KazNRTU the university developed and approved long-term and annual Personnel development plans for faculty and administrative staff. In the frame of the Strategy “Kazakhstan 2050”, the Government of Kazakhstan developed a State Programme for Industrial Innovation Development, and KazNRTU was selected for implementation of the research and educational part of this program. In both self assessment reports KazNRTU provides evidence and figures of further education and didactical training that has taken place recently. Hence, the peers could see that there are offers and support mechanisms available for teaching staff who wish to further develop their professional and teaching skills. Additionally, the representatives from the management of KazNRTU stressed that more than 400 teachers had received training to improve their English speaking skills. However, when talking to the staff members most of them refused to speak English as they felt that their level of English was not adequate to converse in a proper way. The peers underlined their conviction that learning a language can best be achieved through practical application and they recommended encouraging staff members to offer components of their lectures in English and give students the tasks to write and present in English.

<b>Criterion 4.3 Funds and equipment</b>
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**Evidence:**

- Self Assessment Report, chapter 4.3
- Detailed lists of equipment in the self-assessment report
- Visit of laboratories
- Discussion with management and representatives from business

**Preliminary assessment and analysis of the peers:**

During the discussion with representatives of the management of KazNRTU the peers learnt that 80% of the overall funds for teaching and equipment stem from governmental funds. Additional 20% of the budget is provided by private companies. While the peers

believed that the governmental funding was closely linked to the number of students permitted to the university and the funding was secured for the next years, the peers wondered if the university can count on the resources provided by private companies. Management of the university as well as representatives from business pledged that the partner companies of KazNRTU were highly dedicated to support the university. The university and its partner companies sign long term agreements of three to five years, and the university actively contributes to the technological development of the companies by conducting research projects (final theses). Finally, the peers indicated that they could not really verify this statement but as they understood that the core business was secured they accepted this explanation.

The peers visited the laboratories for both degree programmes and confirmed that the laboratories were partly very old but appropriate to teach basic principles of engineering. It was explained that KazNRTU received state funding which enabled the university to renew and upgrade equipment from time to time. Even though the equipment as such is appropriate for teaching basic principles the peers recommended increasing the number of machinery for practical lessons because the peers saw that the number of equipment was a bottleneck for carrying out all practical lessons smoothly. The auditors had not been able to visit the library of the KazNRTU but the students confirmed that up to date teaching books and scientific publications were sufficiently available through the internet and the library.

KazNRTU claims to maintain a number of international cooperation programmes but no cooperation agreements or other kinds of binding documents referring to the programmes under accreditation had been provided. The peers asked KazNRTU to provide respective agreements as additional information.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 4:**

The peers acknowledged that KazNRTU is one of the leading research universities in the country and highly appreciated the research efforts of some of the professors. However, based on their analysis the peers gained the impression that KazNRTU could even be more successful in (industrial) research activities if more professors were actively involved and contributed to it. But this means that the overall environment needs to be made more conducive for professors to get involved more actively in research. Hence, the peers recommended making the environment for research activities more conducive and encourage staff members (possibly also with incentives) to get more actively involved in research activities.

The peers highly welcomed the indication of KazNRTU to spend a considerable amount of resources for the development of professional skills and improvement of the English language knowledge. As indicated in the report, the peers are aware that staff members have received a lot of English training already but still they are lacking the skill to practically apply their knowledge. Hence, the peers recommend to particularly support the training of practical speaking English language skills.

The peers highly appreciated the announcement of KazNRTU to upgrade lab facilities with new equipment models, catalogs of leading companies producing mining, metallurgical and oil and gas machinery. Also the plan to acquire simulators for training students on different hardware is highly welcomed. The further cross-check the developments at the time of reaccreditation, the peers keep recommending to improve the technical equipment for practical lessons.

## 5. Transparency and documentation

### Criterion 5.1 Module descriptions

#### **Evidence:**

- Module descriptions

#### **Preliminary assessment and analysis of the peers:**

As indicated previously, module descriptions had been submitted but not a complete set. A number of module descriptions are still missing, and the peers kindly request the university to provide these module descriptions. The students indicated that the module descriptions are provided to them at the beginning of the semester via intranet. The peers underlined that all subject specific information including the module descriptions should be made available also in English on the website of the university.

Looking at the content of the module descriptions, the peers saw that the module descriptions contain most of the expected information like the title, the semester when the module takes place, the language and the responsible lecturer. However, the workload and the credit points are not consistently applied. It should be clear which credit points are applied (Kazakh or ECTS) and the exact amount of contact time and time for self study. Furthermore, each credit point should have a clearly defined workload. The recommended prerequisites are understandable and clear and the module objectives make the taxonomical differentiation between knowledge, ability, and competence. Also the content of the modules is described in a comprehensible way according to the peers. The

examination refers exclusively to the final examination but all examinations and the exact type of examination as well as the weighing factor need to be indicated as the peers underlined. The module description states the media employed but it is important to describe the teaching method that is being applied. Group work, projects and other kinds of teaching method should be clearly indicated. The literature list provides a good overview of typical literature in most cases. The frequency of offer and the duration of the module should also be added. The peers request that the module descriptions are being revised according to the mentioned shortcomings.

### **Criterion 5.2 Diploma and Diploma Supplement**

#### **Evidence:**

- Certificate of study programme
- Transcript of Records of study programme
- Diploma Supplement are missing

#### **Preliminary assessment and analysis of the peers:**

The peers comprehended that after graduation a degree certificate is issued. A Diploma Supplement printed in English is missing.

The documents available provide information in English on the student's individual performance. The individual modules and the grading procedure on which the final mark is based are explained in a way which is clear for third parties.

Statistical data as set forth in the ECTS User's Guide is not included to allow readers to categorise the individual result/degree.

### **Criterion 5.3 Relevant rules**

#### **Evidence:**

- No official rules and regulations had been provided

#### **Preliminary assessment and analysis of the peers:**

The Peers ask the university to provide all study programme and university-wide rules and regulations in English

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 5:**

As indicated under criterion 1, the peers acknowledged the revision of the module descriptions which gives them a better picture of the content of the modules and programmes, however the peers still have considerable problems to understand the modules as they had been submitted in separate files and without proper naming. The peers highlight that the module descriptions need to be revised and submitted in one file ideally with a table of contents. The peers thanked KazNRTU for the Diploma Supplements, however, the Diploma Supplement used by KazNRTU does not contain the full set of information that is normally provided in a Diploma Supplement. The peers underline that KazNRTU needs to ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student. The peers understood that all activities of KazNRTU are based on state regulations and on internal regulations developed by the Internal Audit Department. However, the regulations are not available to the peers and they underline that KazNRTU has to submit the implemented regulations.

## **6. Quality management: quality assessment and development**

<b>Criterion 6 Quality management: quality assessment and development</b>
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**Evidence:**

- Self Assessment Report, chapter 6
- [http://kazntu.kz/sites/default/files/new-392\\_07.12.15\\_rukovodstva.pdf](http://kazntu.kz/sites/default/files/new-392_07.12.15_rukovodstva.pdf) (Access 15.03.2016)
- Discussion with lecturers and students

**Preliminary assessment and analysis of the peers:**

The peers were told that according to the development strategy of KazNRTU the university wants to further develop its research competences and its status as a research university. This application requires that the principles of quality management in accordance with the requirements of the standard ISO 9001-2008 and the standards and guidelines of ENQA are observed. The peers understood that a quality management policy was avail-



able in Russian and published on the website. If students have a specific request or a complaint there is a website available to address the management of KazNRTU directly.

Furthermore, the peers were explained that a number of different quality measures had been established and were maintained. At the beginning and at the end of each semester a systematic analysis of the educational material and approaches was carried out. This included the critical analysis of the curriculum, working programs of disciplines, teaching materials, practical, laboratory and course work as well as methods of monitoring. The purpose of this exercise was to verify that the material was designed in away to achieve the intended learning outcomes.

Additionally, the degree of customer satisfaction is determined regularly by the Scientific and Practical Center of social monitoring of the University. Internal audits are taking place to monitor the functioning of the quality management system. At the end of each semester, lecturers are assessed by students. The students have to fill in an electronic questionnaire anonymously; the data is analysed and made available to the Management and the Head of Department. The respective data is presented in the self assessment report of KazNRTU. If a lecturer receives a bad evaluation the head of Department talks to the respective professor and tries to identify the reason for complaints; the professor is supposed to improve the teaching approach. The lecturers do not discuss the results of the evaluation with the students and the students cannot follow up if any changes are actually taking place based on the evaluation. Hence, even though the peers understood that evaluation and monitoring data is collected and analysed systematically, it remained unclear to the peers how this data is actually used to take action to improve the shortcomings that had been identified. Therefore, the peers recommended ascertaining that the feedback loops (e.g. teaching evaluation) are defined and feedback is provided to the students.

The auditors could see that a quality assurance policy and quality assurance procedures were in place; however they underline that the Quality Management System must be further developed and internal feedback loops must be established to reflect upon the results and generate means to further improve the processes of the university.

**Final assessment of the peers after the comment of the Higher Education Institution regarding criterion 6:**

The peers appreciated the Provision of a “Quality Manual” and a “Student manual” and the peers comprehended that a number of methods for quality management had been implemented. KazNRTU explained that the Scientific and Practical Center for Social Monitoring receives the evaluation data and prepares the “Report on analysis of survey results”: The peers understood that this report is discussed at the Academic Council and

depending on its decision and needs to be approved. Nevertheless, it remains unclear to the peers how the actual feedback loop in terms of implementing measures to improve processes and instruments at the university is actually taking place. That is why the peers stick to their requirement that KazNRTU has to ascertain that the feedback loops are closed and feedback is provided to the students.

## **D Additional Documents**

Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

1. Rules and Regulations (covering all administrative topics)
2. Complete set of module descriptions
3. Cooperation agreements between KazNRTU and international partner institutions
4. Diploma supplements for all degree programmes

## E Assessment of the peers

The peers recommend the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ma Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ba Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021
Ma Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021

### Requirements

- A 1. (ASIIN 2.1) The qualification objectives and other programme relevant information should be accessible in English for all relevant stakeholders.
- A 2. (ASIIN 2.2) It should be verified that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.
- A 3. (ASIIN 5.1) The module descriptions should include reliable information about the teaching formats, conditions for the award of credits, ECTS credits and grades, frequency of offer, weighing factor of each examination for the final grade, workload and duration of each module.
- A 4. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.
- A 5. (ASIIN 5.3) KazNRTU needs to submit the implemented rules and regulations.
- A 6. (ASIIN 6) It is required that the feedback loops in the quality management system are closed, that feedback is provided to the students and that students are involved in the further development of the degree programmes.

## **Recommendations**

- E 1. (ASIIN 2.1) The educational objectives/learning outcomes should describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes. Additionally, all subject specific information should also be provided in English on the webpage.
- E 2. (ASIIN 1.3, 2.3) It is recommended to provide more managerial skills (time management, looking for scientific sources, problem solving strategies) at the beginning of the studies to make the independent work more effective.
- E 3. (ASIIN 2.3) It is recommended to increase the amount of interdisciplinary projects as a teaching method.
- E 4. (ASIIN 2.3) It is recommended to foster the oral and written English skills (e.g. English courses, write and present English papers, usage of English documents) and to offer more opportunities for students to participate in international exchanges.
- E 5. (ASIIN 4.2) Staff members should be offered more opportunities to enhance the English speaking and writing skills.
- E 6. (ASIIN 4.1) It is recommended to make the environment for research activities more conducive and encourage staff members to get more actively involved in research activities.
- E 7. (ASIIN 4.2) It is recommended to provide more technical equipment for practical lessons.

## F Assessment of Technical Committee 01 – Mechanical Engineering / Process Engineering

*Assessment and analysis for the award of the ASIIN seal:*

The Technical Committee fully comprehends the requirements and recommendations and sees no need for amendments. The peers accept the suggestions of the peers without changes.

*Assessment and analysis for the award of the EUR-ACE® Label:*

The Technical Committee confirms that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 01.

The Technical Committee 01 – Mechanical and Process Engineering recommends the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN-seal</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ba Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ma Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ba Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021
Ma Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021

### Requirements

- A 1. (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.
- A 2. (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.
- A 3. (ASIIN 5.1) Rewrite the module descriptions so as to include information about the the teaching formats, conditions for the award of credits, ECTS credits and grades,

frequency of offer, weighing factor of each examination for the final grade, workload and duration of each module.

- A 4. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.
- A 5. (ASIIN 5.3) Submit the implemented rules and regulations.
- A 6. (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

## **Recommendations**

- E 1. (ASIIN 2.1) It is recommended that the educational objectives/learning outcomes describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes are accessible to . Additionally, all subject specific information should also be provided in English on the webpage.
- E 2. (ASIIN 1.3, 2.3) It is recommended to provide more managerial skills (time management, looking for scientific sources, problem solving strategies) at the beginning of the studies to make the independent work more effective.
- E 3. (ASIIN 2.3) It is recommended to increase the amount of interdisciplinary projects as a teaching method.
- E 4. (ASIIN 2.3) It is recommended to foster the oral and written English skills (e.g. English courses, write and present English papers, usage of English documents) and to offer more opportunities for students to participate in international exchanges.
- E 5. (ASIIN 4.2) It is recommended to offer staff members more opportunities to enhance the English speaking and writing skills.
- E 6. (ASIIN 4.1) It is recommended to make the environment for research activities more conducive and encourage staff members to get more actively involved in research activities.
- E 7. (ASIIN 4.2) It is recommended to provide more technical equipment for practical lessons.

## G Decision of the Accreditation Committee of ASIIN (01.07.2016)

*Assessment and analysis for the award of the ASIIN seal:*

The Accreditation Committee discussed the report and made some editorial changes for clarifying the circumstances.

*Assessment and analysis for the award of the EUR-ACE® Label:*

The Accreditation Committee confirms that the intended learning outcomes of the degree programmes do comply with the engineering specific part of Subject-Specific Criteria of the Technical Committee 01.

The Accreditation Committee decided the award of the seals as follows:

<b>Degree Programme</b>	<b>ASIIN-seal</b>	<b>Subject-specific label</b>	<b>Maximum duration of accreditation</b>
Ba Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ma Mechanical Engineering	With requirements for one year	EUR-ACE	30.09.2021
Ba Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021
Ma Technological Machines and Equipment	With requirements for one year	EUR-ACE	30.09.2021

### Requirements

- A 1. (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.
- A 2. (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.
- A 3. (ASIIN 5.1) Rewrite the module descriptions so as to include information about the the teaching formats, conditions for the award of credits, ECTS credits and grades, frequency of offer, weighing factor of each examination for the final grade, workload and duration of each module.



- A 4. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.
- A 5. (ASIIN 5.3) Submit the implemented rules and regulations.
- A 6. (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

### **Recommendations**

- E 1. (ASIIN 2.1) It is recommended that the educational objectives/learning outcomes describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes are accessible to . Additionally, all subject specific information should also be provided in English on the webpage.
- E 2. (ASIIN 1.3, 2.3) It is recommended to provide more managerial skills (time management, looking for scientific sources, problem solving strategies) at the beginning of the studies to make the independent work more effective.
- E 3. (ASIIN 2.3) It is recommended to increase the amount of interdisciplinary projects as a teaching method.
- E 4. (ASIIN 2.3) It is recommended to foster the oral and written English skills (e.g. English courses, write and present English papers, usage of English documents) and to offer more opportunities for students to participate in international exchanges.
- E 5. (ASIIN 4.2) It is recommended to offer staff members more opportunities to enhance the English speaking and writing skills.
- E 6. (ASIIN 4.1) It is recommended to make the environment for research activities more conducive and encourage staff members to get more actively involved in research activities.
- E 7. (ASIIN 4.2) It is recommended to provide more technical equipment for practical lessons.

## H Decision of Accreditation Commission: Fulfillment of Requirements (31.03.2017)

### Requirements

- A 1. (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.

Initial Treatment	
Peers	Partly fulfilled Justification: The peers noted that most documents have been made available in English. However, the Rules of admission linked <a href="http://talapker.kazntu.kz/en/node/633">http://talapker.kazntu.kz/en/node/633</a> are still in Russian. The standard rules of admission are available in English ( <a href="http://kazntu.kz/en/bachelor/tpp">http://kazntu.kz/en/bachelor/tpp</a> ).
TC 01	not fulfilled Justification: The Technical Committee criticized that the standard rules of admission are not available in English. The Committee requests to publish the admission rules also in English.

- A 2. (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.

Initial Treatment	
Peers	Not Fulfilled Justification: The peers noted that the module descriptions have been reworked and the student work-load as well as the ECTS credit points are being presented in a transparent manner. However, the calculation of workload to ECTS credit points is not applied consistently. The amount of student workload varies per ECTS credit point from module to module. The peers are of the opinion that this needs to be rectified.
TC 01	not fulfilled Justification: The peers noted that the module descriptions have been reworked and the student work-load as well as the ECTS credit points have been presented in a transparent manner. However, the calculation of workload to ECTS credit points is not applied consistently. The amount of student workload varies per ECTS credit point from module to module. The peers are of the opinion that this needs to be rectified.

- A 3. (ASIIN 5.1) Rewrite the module descriptions so as to include information about the teaching formats, conditions for the award of credits, ECTS credits and grades, frequency of offer, weighing factor of each examination for the final grade, work-load and duration of each module.

Initial Treatment	
Peers	Fulfilled Justification: The peers could see that the module descriptions have been revised and are published on the websites. Apart from the ECTS /student workload relation, the peers welcome the efforts undertaken by KazNRTU and concluded that this requirement is fulfilled.
TC 01	fulfilled Justification: The Technical Committee agrees to the assessment of the peers and confirms that this requirement is fulfilled.

- A 4. (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes, the structure and the academic level of the degree programme as well as about the individual performance of the student.

Initial Treatment	
Peers	fulfilled Justification: KazNRTU submitted Diploma supplements which provide all relevant information. The requirement is fulfilled.
TC 01	fulfilled Justification: The Technical Committee agrees to the assessment of the peers and confirms that this requirement is fulfilled.

- A 5. (ASIIN 5.3) Submit the implemented rules and regulations.

Initial Treatment	
Peers	Fulfilled Justification: All relevant rules have been made available. The peers concluded that the requirement is fulfilled.
TC 01	fulfilled Justification: The Technical Committee agrees to the assessment of the peers and confirms that this requirement is fulfilled.

- A 6. (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

Initial Treatment	
Peers	Not fulfilled Justification: The peers could not find the information DP 708 KazNRTU_QUALITY OF EDUCATIONAL PRO-CESS. This document needs to be made available to ASIIN.
TC 01	not fulfilled Justification: The Technical Commission was unable to access the indicated document that was intended to prove the fulfillment of the requirement. Therefore, the Accreditation Commission could not assess the fulfillment of the requirement..

**Decision of the Accreditation Commission, 31.03.2017:**

Study programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Mechanical Engineering	Requirement 1, 2, 6 not fulfilled	EUR-ACE®	6 months prolongation
Ba Technological Machines and Equipment	Requirement 1, 2, 6 not fulfilled	EUR-ACE®	6 months prolongation
Ma Mechanical Engineering	Requirement 1, 2, 6 not fulfilled	EUR-ACE®	6 months prolongation
Ma Technological Machines and Equipment	Requirement 1, 2, 6 not fulfilled	EUR-ACE®	6 months prolongation

The Accreditation Commission justifies its decision as follows:

Requirement 1: (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.

The Accreditation Commission welcomed that most documents have been made available in English. However, the Rules of admission are not linked properly and could not be opened by the Commission. Consequently, the Accreditation Commission was unable to judge the complete fulfillment of this requirement.

Requirement 2: (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evalu-

ation). The ECTS-credits and the actual Workload must be described in the module descriptions.

The Accreditation Commission appreciated the profound revision of the module description and the good quality that has been achieved now. However, the Accreditation Commission noted that there were still a number of inconsistencies in ECTS credit point and work load calculation and concluded that the requirement was not fulfilled yet.

Requirement 6: (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

The Accreditation Commission was unable to access the indicated document that was intended to prove the fulfillment of the requirement. Therefore, the Accreditation Commission could not assess the fulfillment of the requirement.

The Accreditation Commission justifies its decision as follows:

Requirement 1: (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.

The Accreditation Commission welcomed that most documents have been made available in English. However, the Rules of admission are not linked properly and could not be opened by the Commission. Consequently, the Accreditation Commission was unable to judge the complete fulfillment of this requirement.

Requirement 2: (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.

The Accreditation Commission appreciated the profound revision of the module description and the good quality that has been achieved now. However, the Accreditation Commission noted that there were still a number of inconsistencies in ECTS credit point and work load calculation and concluded that the requirement was not fulfilled yet.

Requirement 6: (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

The Accreditation Commission was unable to access the indicated document that was intended to prove the fulfillment of the requirement. Therefore, the Accreditation Commission could not assess the fulfillment of the requirement.

# I Decision of Accreditation Commission: Fulfillment of Requirements (29.09.2017)

## Requirements

### For all study programmes

- A 1. (ASIIN 2.1) Make the qualification objectives and other programme relevant information accessible in English for all relevant stakeholders.

Peers	fulfilled Justification: All relevant information appears in English on the website now.
TC 01	Fulfilled Justification: All relevant information appears in English on the website now.

- A 2. (ASIIN 2.2) Prove that the awarded ECTS-credits for the modules correspond to the actual workload of the students (e.g. based on results of the teaching evaluation). The ECTS-credits and the actual Workload must be described in the module descriptions.

Peers	fulfilled Justification: The calculation of workload to ECTS credit points is applied consistently now.
TC 01	fulfilled Justification: The calculation of workload to ECTS credit points is applied consistently now.

- A 3. (ASIIN 6) Close the feedback loops in the quality management system and ensure that feedback is provided to the students and that students are involved in the further development of the degree programmes.

Peers	fulfilled Justification: The relevant document has been made available to the peers. The peers confirm that this document describes how the feedback loops are closed.
TC 01	fulfilled Justification: The relevant document has been made available to the peers. The peers confirm that this document describes how the feedback loops are closed.

**Decision of the AC Programmes on 29.09.2017:**

<b>Study programme</b>	<b>ASIIN-label</b>	<b>Subject-specific label</b>	<b>Accreditation until max.</b>
Ba Mechanical Engineering	All requirements are fulfilled	EUR-ACE®	30.09.2021
Ba Technological Machines and Equipment	All requirements are fulfilled	EUR-ACE®	30.09.2021
Ma Mechanical Engineering	All requirements are fulfilled	EUR-ACE®	30.09.2021
Ma Technological Machines and Equipment	All requirements are fulfilled	EUR-ACE®	30.09.2021

## **J Learning Objectives and Curricula of the degree programmes**

### **Bachelor Mechanical Engineering**

The uniform goal of training of bachelors Mechanical engineering program (5B071200) – training of specialists for work in the field of mechanical engineering, having theoretical base according to the standard curriculum of specialty, practical skills of design of production, technological processes of production of the products of mechanical engineering owning set of means, ways and methods production and technological design, experimental and research, organizational and economic administrative activity and also it is structure - the design, directed on production competitive production of mechanical engineering on the basis of application of modern methods of calculation and design of samples of new equipment, devices, cars, designs and new materials, the solution of problems of dynamics, durability, reliability of mechanical systems.

The purpose of EP 5B071200 "Mechanical engineering" is the ensuring quality of professional education in the field of technical and technological preparation of production, design and manufacture of mechanical engineering products confirmed with the level of knowledge, abilities, skills and competences on the basis of the criteria established by the state obligatory standard.

The content of "Mechanical engineering" directed on the maximum satisfaction of inquiries of consumers on the basis of development of multilevel system of training, fundamental nature and quality of training, a continuity and succession of science and education, unity of training, education, research and innovative activity has to provide:

- provision of bachelor education for various industries, who knows the methods and principles of research, design, manufacture and operation of mechanical engineering products;
- have an idea about the main directions in the field of humanitarian and socio-economic sciences, analyze socially significant problems and activity processes;
- have the communication skills and be a good team player, adapt to changes and promote social cohesion;
- have the motivation to learn throughout the whole life, have the skills of independent learning and skills development;
- training specialists for research activities in the field of mechanical engineering;



- training of professional and competitive experts in the field of mechanical engineering;
- to have an understanding of modern methods of teaching in universities and colleges, modern methods of research work, the work of specialists in industry and research institutions;
- acquisition of practical skills in designing and technological processes of engineering production (blanking, machining and machine assembly), mathematical processing of research results, preparation of technological processes using modern information technologies.

Graduate in 5B071200 "Mechanical engineering" has to be ready:

- to acquisition of new knowledge and technologies in professional sphere;
- to set goals and to formulate tasks connected with realization of professional functions;
- to have the sufficient fundamental and applied knowledge necessary for professional activity;
- to be able to get an access to global sources of knowledge, to know modern information technologies;
- to know methodology and analytical skills;
- be able to apply methods of carrying out scientific researches;
- to be able to transform the acquired knowledge to innovative technologies;

Bachelor of 5B071200 "Mechanical engineering" perform the following professional activities:

- the experimental and research;
- settlement and design and analysis;
- productional and technological;
- service-operational;
- installation-tuning;
- organizational and administrative;
- program - management;
- Educational and pedagogical.

Discipline cycle	Code discipline	The name Disciplines	Quantity of credits	Semestre	The control form
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>GED 1</b>	General educational disciplines		<b>33</b>		
<b>OC 1.1</b>	Obligatory component		<b>33</b>		
	IK 1101	History of Kazakhstan	3	1	Examination
	Inf 1104	Computer science	3	1	Examination
	OBZh 1103	Health and safety bases	2	1	Examination
	Soc1104	Sociology	2	1	Examination
	Eko 1105	Ecology and sustainable development	2	1	Examination
	K(R)Ya 1106	The Kazakh (Russian) language	6	1,2	Examination
	OET 2107	Bases of the economic theory	2	3	Examination
	IYa 2108	Foreign language	6	3,4	Examination
	OP2109	Right bases	2	4	Examination
	Pol2110	Political science	2	4	Examination
	Fil2111	Philosophy	3	4	Examination
<b>CC 1.2</b>	Elective Component				
BD2	Base disciplines		64		
OC 2.1	Obligatory component		<b>20</b>		
	Him 1201	Chemistry	2	1	Examination
	Mat1202	Mathematics	5	1-2	Examination
	Fiz 1203	Physics	5	3	Examination
	OV2204	Interchangeability bases	4	4	Examination
	PK(R)Ya 3205	Professional Kazakh (Russian) language	2	5	Examination
	IYa 2108	The is professional-focused foreign language	2	5	Examination,
<b>CC 2.2</b>	Elective Component		44		
MS 3	The main subjects		32		
OC3.1	Obligatory component		<b>5</b>		
	TPMP 2301	Technological processes of machine-building manufacture	3	4	Examination
	MG3302	The machine drawing	3	5	Examination
<b>CC 3.2</b>	Elective Component		<b>27</b>		

		<b>TOTAL</b>	<b>129</b>		
<b>AKT 4</b>	<b>Additional kinds of training</b>				
	<b>Practice:</b>		<b>Not less than 6*</b>		
	The educational				The report
	The industrial				The report
	Externship				The report
<b>PT</b>	Physical training		<b>16</b>		
<b>CC</b>	Elective Component				
<b>ISC 5</b>	Total certification		<b>3</b>		
<b>TSC 6</b>	Total state certification		<b>15*</b>		
		1 Graduation examination in a speciality	1	8	
		2 Writing and protection of the thesis (project)	2	8	
	<b>TOTAL</b>		<b>Not less than 154</b>		
<p>The note</p> <p>1) In curricula it is recommended to use uniform system of the coding</p> <p>The disciplines, providing assignment to each discipline of the curriculum of a corresponding code in symbols alphabetic (three or four capital letters of the Latin alphabet) and digital expression (three- or four-unit where the first figure specifies a course);</p> <p>2) * On group specialities «Engineering science and technologies» from 6 to 15 credits;</p> <p>3) At realisation of professional curriculums of higher education the higher educational institution has the right:</p> <ul style="list-style-type: none"> <li>- To transfer studying of disciplines from one semestre to another, without breaking the logic of development of the professional curriculum;</li> <li>- volume of disciplines of an obligatory component at the expense of additional kinds of training;</li> <li>- Independently with the account <i>переквизитов</i> to establish terms of carrying out an expert.</li> </ul>					

## Master Mechanical Engineering

The purpose of EP 6M071200 - Mechanical engineering is to provide quality profile and scientific-pedagogical education in mechanical engineering, training of specialists (Masters), capable of solving scientific problems of modern mechanical engineering, independently solve issues of designing, implementation and maintenance of new technological processes and machines.

The aim of EP 6M071200 - Mechanical engineering:

- Profile preparation is to obtain high-grade and high-quality professional education, professional competence, deepening the theoretical and practical individual training of undergraduates in engineering, the development of undergraduates knowledge that provides a holistic perception of the world picture, training, the ability to formulate and practically solve modern practical problems of Mechanical engineering production successfully for carrying out production and management activities in the machine building industry;
- Scientific and pedagogical training is to obtain a complete and high-quality scientific and teacher education, professional competence, deepening the theoretical and practical individual training of undergraduates in engineering, the development of undergraduates knowledge, providing holistic perception of the world picture, training, the ability to construct and to design a solution for modern scientific and practical problems of engineering production, teaching at universities and successfully to be engaged in research management activities.

Learning outcomes are determined on the basis of the Dublin descriptors of the second level (Master) and are expressed in terms of competence. Learning outcomes are formulated both at the level of the entire program, and at the level of the module, a separate discipline.

Learning outcomes of Master degree program 6M071200 - Mechanical engineering are:

- the ability to develop knowledge obtained at the level of higher education, which are the basis for the finding and application creative ideas, often in the context of scientific research in the field of mechanical engineering;
- The development of the most important and sustainable knowledge;
- The ability to apply knowledge, understanding and ability to solve problems in new or unfamiliar situations in the interdisciplinary areas related to the field of mechanical engineering;

- The ability to integrate acquired knowledge, to cope with the difficulties and make judgments based on incomplete or limited information, taking into account the ethical and social responsibility for the use of judgment and knowledge;
- The ability accurately and clearly to tell the conclusions, knowledge and their justification to experts and non specialists;
- The ability to continue learning on one's own.
- Core Academic Competencies for graduates of master's:
- The graduates of master's should have an idea on:
  - the current trends in the development of scientific knowledge;
  - the current methodological and philosophical problems of the natural sciences;
  - the contradictions and the socio-economic impacts of globalization;

Should know:

- The methodology of scientific knowledge; principles and structure of the organization of scientific activity;
- Psychological methods and means to improve the efficiency and quality of education;
- Should be able to:
  - Apply scientific methods of knowledge in professional activity;
  - Critically analyze existing concepts, theories and approaches to the study of processes and phenomena;
  - To integrate the knowledge gained in the framework of different disciplines, use them for solving analytical and management tasks in the new unfamiliar environment;
  - Creative thinking and creative approach to new challenges and situations;
  - To carry out information-analytical and information-bibliographical work using modern information technologies;
  - Summarize the results of experimental research and analysis in the form of a dissertation, scientific publications in the form of articles or reports.
- -Be competent in the field of research methodology;
- -In the field of scientific and educational activities in higher education;
- -In the implementation of research projects and research in the professional field;
- -Methods of constant provision knowledge , expansion professional skills.

To prepare the master's degree - Engineering Department "Standardization, Certification and Engineering Technology" formulates working curriculum, which assumes a hierarchy of objectives EP, the transition from the basic disciplines of profiling and managerial and further to the highly specialized disciplines related to specific industries.

Discipline cycle	Code distsip-liny	The name Disciplines	Quantity of credits	Semestr e	The control form
BD	Base disciplines		<b>20</b>		
OC	Obligatory component		<b>8</b>		
	IFN 5201	History and science philosophy	2	1	Examination
	IYa 5202	Foreign language (professional)	2	1	Examination
	Ped 5203	Pedagogics	2	1	Examination
	Psi 5204	Psychology	2	1	Examination
CC 2.2	Elective Component		<b>12</b>		
MS 3	The main subjects		<b>22</b>		
OC3.1	Obligatory component		<b>2</b>		
	KM 5301	Квалиметрия in mechanical engineering	2	2	Examination
CC	Elective Component		<b>20</b>		
	Total theoretical training		<b>42</b>		
ДВО	Additional kinds of training		<b>Not less than 13</b>		
ППИ	Practice (pedagogical, research)		Not less		The report
НИРМ	Scientifically - research work магистранта, including performance магистерской dissertations		Not less 7		The report
ТС	Total certification		<b>4</b>		
СЕ	Complex examination		<b>1</b>	4	
RPMD	Registration and protection master dissertations		3	4	
	<b>Total</b>		<b>Not less 59</b>		

The note \* Quantity of the credits allocated for practice, is not included into the general labour input. In case of need the high school can increase number of the credits allocated for

## **Bachelor Technological Machines and Equipment**

Technological machines and equipment (5B(6M)072400) degree programmes students are trained at the Mining and Metallurgical Institute, on the Basis of Core chairs as at the «Mining and metallurgical machines and equipment» and «Machines and equipment Oil and Gas Industry» KazNTU named after K I Satpayev. Ministry of Education and Science of Republic of Kazakhstan.

Teaching on this degree programme is carried out on the basis of state educational standard of higher education of the Republic of Kazakhstan №1080 from August 23, 2012.

According to the degree programme "5B072400- Technological machines and equipment (by industry)" training process is conducted on the loan program, 4-year training. Qualification is - Bachelor.

According to the degree programme "6M072400- Technological machines and equipment (by industry)", the educational process is conducted on credit technology, training period of 2 years. Qualification is - Master of Science.

Degree programs 5B072400 and 6M072400 - Technological machines and equipment (by industry), passed an accreditation assessment in 2011 by accreditation agency AIOR (Russian Federation).

Admission is carried out in accordance with the Rules of admission to the baccalaureate. The requirements for minimum passing score on the results of the Unified National Test and CT scans on admission into the national university (70 points) followed.

The list of degree programs of the specialty is established by the academic council of higher education institution independently in accordance with the Dublin descriptors agreed with the European Qualifications Framework.

Training specialists in 5B072400- Technological machines and equipment (by industry), 6M072400- Technological machines and equipment (by industry) is conducted in accordance with the model and the module curriculum of the degree programme.

The study of disciplines based on the study of the cycle of general education, basic and specialized disciplines that create the students the necessary knowledge base, enhance their level of training, to discover their abilities and creative interest, allows to prepare bachelors in the field of metallurgy, improvement of traditional and development of new materials with advanced knowledge that may be demanded by society in industrial plants, steel mills, production and industrial complexes and businesses, research institutes, institutions of education and science.

An objective of degree programme 5B072400- Technological machines and equipment (by industry) is to provide professional training of educated and qualified Bachelor of Science in the field of new materials and advanced technologies for obtaining and processing materials.

The objectives of degree programme bachelor 5B072400- Technological machines and equipment (by industry)

Objective 1. Social-humanitarian and professional training of bachelors in the field of mining and metals, oil and gas industry in accordance with the development of science and technology as well as the changing needs of the mining industry, research centers, graduate schools in the frames of the training.

Objective 2. Training of bachelors knowledgeable source of raw materials, production technology and consumption of metals with fundamental training in physics, mathematics, chemistry, physical and chemical bases of technology of mining and metals, oil and gas industry.

Objective 3. To provide the knowledge and skills allows analyzing problems in the area of professional activities, and find ways to solve them, solve engineering design problems of technology and equipment of factories, and carry out experimental - research using information technology and mathematical modelling.

Objectives of degree programme:

1. Study of the cycle of general disciplines for social and humanitarian education based on the laws of socio-economic development of society, history, modern information technologies, the state language, foreign and Russian languages.
2. Study of the cycle of basic disciplines to provide knowledge of the natural sciences, general technical and economic disciplines, as the foundation of vocational education.
3. Study of the cycle majors for the formation of theoretical knowledge and practical skills in technology machines and equipment mining and metals, oil and gas industry.
4. Study of disciplines forming the knowledge skills of planning and organization of research, design technologies and devices.
5. Introduction to the technology and equipment of factories and plants in the period of holding of various types of practices.
6. Acquisition of skills of laboratory research, technological calculations, equipment selection and design using modern computer technology and programs.



J Learning Objectives and Curricula of the degree programmes

Course: 1 Semester: Fall

Cycle of basic disciplines

Required component														
BD	1.1.1	Mat(I)1201	Mathematics I	4	6	1	0	3	1/0/3/1	1	3	T		Mathem
BD	1.1.2	Fiz(I)1202	Physics I	4	6	2	1	1	2/1/1/1	1	3	T		Physics
BD	1.1.3	Him1203	Chemistry	3	5	2	1	0	2/1/0/1	1	2	T		
BD	1.1.4	NGHG1204	Descriptive geometry and computer graphics	4	6	1	3	0	1/3/0/1	1	3	II		DGG
BD	1.1.5	Inf1104	Information science	3	5	2	1	0	2/1/0/1	1	2	T		PM

Cycle of extra curricular educational disciplines

Required component														
ECED		Ft	Physical training	2		0	0	2	0/0/2/0	0	0			P&T

Course: 1 Semester: Spring

Cycle of general educational disciplines

Required component														
GED	1.2.1	FYal(2)103	Foreign language	3	5	0	0	3	0/0/3/1	1	2	Y		ForLang
GED	1.2.2	K(R)Yal102	Kazakh (Russian) language	3	5	0	0	3	0/0/3/1	1	2	Y		KazLang
GED	1.2.3	IK1101	History of Kazakhstan	3	5	1	0	2	1/0/2/1	1	2	II		SD

Cycle of basic disciplines

Required component														
BD	1.2.6	Mat(II)1201	Mathematics II	4	6	1	0	3	1/0/3/1	1	3	T		Mathem
BD	1.2.7	Fiz(II)1202	Physics II	4	6	2	1	1	2/1/1/1	1	3	T		Physics
BD	1.2.8	SSM1201	Standardization, certification, and metrology	3	5	2	0	1	2/0/1/1	1	2	II		SCTMTB

Cycle of extra curricular educational disciplines

Required component														
ECED		FK	Physical training	2		0	0	2	0/0/2/0	0	0			P&T
ECED		VP	Military training	2		0	0	2	0/0/2/0	0	0	Y		

Required component														
GAK		GE	Qualification Exam on Hist. of Kazakh.	0		0	0	0	0/0/0/0	0	0			SD

Course: 2 Semester: Fall

Cycle of general educational disciplines

Required component														
GED	2.1.4	Phi1106	Philosophy	3	5	1	0	2	1/0/2/1	1	2	T		SD
GED	2.1.5	DelGos2105	Office work in state language	2	3	0	0	2	0/0/2/1	1	1	Y		KazLang

Cycle of basic disciplines

Required component														
BD	2.1.10	TT2110	Thermodynamics and heat transmission	3	5	2	1	0	2/1/0/1	1	2	II		MEPGI
BD	2.1.11	EUR2105	Ecology and sustainable development	3	5	1	0	2	1/0/2/1	1	2	T		AE
BD	2.1.12	PME2112	Applied mechanics	3	5	1	0	2	1/0/2/1	1	2	T		AM&BMD
BD	2.1.13	PF2206	Applied physics	3	5	1	0	2	1/0/2/1	1	2	T		Physics

J Learning Objectives and Curricula of the degree programmes

BD	2.1.9	MatZed	Tasks of mathematic	2	3	0	0	2	0/0/2/1	1	1	T					Mathem
Electives																	
BD	2.1.14	KTYa2201	Kazakh technical language	3	5	0	0	3	0/0/3/1	1	2	Y					KazLang
BD	2.1.14.1	RTYa2202	Russian technical language	3	5	0	0	3	0/0/3/1	1	2	Y					RusLang
BD	2.1.14.2	ITYa2203	Foreign technical language	3	5	0	0	3	0/0/3/1	1	2	Y					ForLang

Cycle of extra curricular educational disciplines

Required component																	
ECED		FK	Physical training	2		0	0	2	0/0/2/0	0	0						PaT
ECED		VP	Military training	2		0	0	0	0/0/0/0	0	0	Y					

Course: 2 Semester: Spring

Cycle of general educational disciplines

Electives																	
GED	2.2.6	POL2101	Political science	3	5	2	0	1	2/0/1/1	1	2	T					SD
GED	2.2.6.1	OP2102	Basics of law	3	5	2	0	1	2/0/1/1	1	2	T					SD
GED	2.2.6.2	Soc2103	Sociology	3	5	2	0	1	2/0/1/1	1	2	T					SD
GED	2.2.6.3	Kul2104	Culturology	3	5	2	0	1	2/0/1/1	1	2	T					SD
GED	2.2.6.4	TAGP2105	Discipline around adaptation to training axading	3	5	2	0	1	2/0/1/1	1	2	T					
GED	2.2.6.5	ZIS2106	Defence intellect possessions	3	5	2	0	1	2/0/1/1	1	2	Π					

Cycle of basic disciplines

Required component																	
BD	2.2.15	Ele2206	Electrical engineering	3	5	2	1	0	2/1/0/1	1	2	Π					EE
BD	2.2.16	OPDM2209	Basics of projecting and machine components	3	5	2	0	1	2/0/1/1	1	2	T	4				AM&BMD
BD	2.2.17	SM2208	Strength of materials	3	5	2	0	1	2/0/1/1	1	2	T					AM&BMD
Electives																	
BD	2.2.18	TGR2207	Technology training works	3	5	2	0	1	2/0/1/1	1	2	T					UDDM
BD	2.2.18.1	RMPF2208	Mining mineral resources deposit	3	5	2	0	1	2/0/1/1	1	2	T					UDDM
BD	2.2.18.2	OMG2209	Volunetric machines and hydrotransmissions	3	5	2	0	1	2/0/1/1	1	2	T					
BD	2.2.18.3	Sat2210	Satpaev studies	3	5	3	0	0	3/0/0/1	1	2		4				GMEM

Cycle of extra curricular educational disciplines

Required component																	
ECED		VP	Military training	2		0	0	0	0/0/0/0	0	0	Y					
ECED		FK	Physical training	2		0	0	2	0/0/2/0	0	0						PaT

Required component																	
CP			Industrial-Introductory Placement	2	5	0	0	0	0/0/0/0	0	0						

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Electives														
BD	3.1.19	MGPPGM3214	Machine the schedule at designing HM	3	5	1	2	0	1/2/0/1	1	2	Π		
BD	3.1.19.1	OKM3215	Bases of computer modelling at xpoaxmDostmmx HM	3	5	1	2	0	1/2/0/1	1	2	Π		
BD	3.1.19.2	GMP3216	Graphic modelling at designing hydraulic machines.	3	5	1	2	0	1/2/0/1	1	2	Π		

Cycle of professional disciplines

Required component														
PD	3.1.1	ITTM3301	Technology of manufacture technological machines	3	5	2	0	1	2/0/1/1	1	2	Π		MEPGI
PD	3.1.2	PKTM3302	Protection and designing of technological machines	3	5	2	0	1	2/0/1/1	1	2	Π		

Electives														
PD	3.1.3	GMO3303	Mining machines and equipment	4	7	2	1	1	2/1/1/1	1	3	Π	5	
PD	3.1.3.1	GTM3304	Mining - technological machines	4	7	2	1	1	2/1/1/1	1	3	Π	5	
PD	3.1.3.2	GOGM3305	The hydraulic equipment of mountain machines	4	7	2	1	1	2/1/1/1	1	3	Π	5	
PD	3.1.4	TM3306	Transportations machines and the equipment	5	9	3	1	1	3/1/1/1	1	4	Π	5	
PD	3.1.4.1	LT3307	Logistic on transport	5	9	3	1	1	3/1/1/1	1	4	Π	5	
PD	3.1.4.2	TMO3308	Technological machines and equipments	5	9	3	1	1	3/1/1/1	1	4	Π	5	

Cycle of extra curricular educational disciplines

Required component														
ECED		VP	Military training	2		0	0	0	0/0/0/0	0	0	Y		

Course: 3 Semester: Spring

Cycle of basic disciplines

Required component														
BD	3.2.20	OTBZ4211	Life and labour safety	3	5	2	0	1	2/0/1/1	1	2	T		LS
BD	3.2.21	EUP3217	Economics and production management	3	5	2	0	1	2/0/1/1	1	2	T	6	

Electives														
BD	3.2.22	PGMCU3218	Protection mining machines and Stationary fitting	4	6	2	0	2	2/0/2/1	1	3	Π		
BD	3.2.22.1	KGMSU3219	Designing mining machines and Stationary fitting	4	6	2	0	2	2/0/2/1	1	3	Π		
BD	3.2.22.2	KGMS220	Hydraulic machines designing	4	6	2	0	2	2/0/2/1	1	3	Π		

Cycle of professional disciplines

Required component														
PD	3.2.5	SAPRIM3305	SAPR of technological machines	3	5	2	0	1	2/0/1/1	1	2	Π		
PD	3.2.6	PTM3306	Transmissions of technological machines	3	5	2	0	1	2/0/1/1	1	2	Π		

Electives														
PD	3.2.7	PU3307	Hoisting units	4	7	2	1	1	2/1/1/1	1	3	Π	6	
PD	3.2.7.1	VTR3308	Vertical transportation in mines	4	7	2	1	1	2/1/1/1	1	3	Π	6	
PD	3.2.7.2	GPPGM	Hydraulic and pneumatics mining machines	4	7	2	1	1	2/1/1/1	1	3	Π	6	

J Learning Objectives and Curricula of the degree programmes

ECED		VP	Military training	2	0	0	0	0	0/0/0/0	0	0	Y					
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Required component																	
CP		PVP	Industrial practice	2	5	0	0	0	0/0/0/0	0	0						

Course: 4 Semester: Fall

Cycle of basic disciplines

Electives																	
BD	4.1.23	ARM4221	Automation calculations parameters technological processes aiming machines and equipment	3	5	1	2	0	1/2/0/1	1	3	II					
BD	4.1.23.1	OKW4222	Basic computer computing technologies in the maintain equipment.	3	5	1	2	0	1/2/0/1	1	2	II					
BD	4.1.23.2	FMPGM4223	Mathemat. computer modelling of param. of maintain machines.	3	5	1	2	0	1/2/0/1	1	2	II					
BD	4.1.24	KIA4224	Controlling and measuring equipment	3	5	2	0	1	2/0/1/1	1	2	II					
BD	4.1.24.1	II4225	Measurement instrument	3	5	2	0	1	2/0/1/1	1	2	II					
BD	4.1.24.2	RMP4226	Controlling and measuring equipment of hydraulic machines	3	5	2	0	1	2/0/1/1	1	2	II					

Cycle of professional disciplines

Required component																	
PD	4.1.8	METM3302	Installation and exploitation of technological machines	3	5	2	0	1	2/0/1/1	1	2	II	7				
PD	4.1.9	RIM4303	Technological machines repair	3	5	2	1	0	2/1/0/1	1	3	II	7				MEPGI
Electives																	
PD	4.1.10	VVPU4310	Demustering, fan and pneumatic plants	4	7	2	1	1	2/1/1/1	1	3	II	7				
PD	4.1.10.1	C&SU4311	Mine stationary installations	4	7	2	1	1	2/1/1/1	1	3	II	7				
PD	4.1.10.2	TIGM4312	Technology of manufacture hydraulic machines	4	7	2	1	1	2/1/1/1	1	2	II	7				

Course: 4 Semester: Spring

## Master Technological Machines and Equipment

Technological machines and equipment (by industry)" must solve the following tasks in accordance with the professional activities:

- In the field of experimental and research activities:
- Analysis of the problem of research in a given area on the basis of selection and study of literature and patent sources;
- Diagnostics of the state and dynamics of the objects of activity materials, processes, equipment in various industries with the necessary tools and methods of analysis;
- Study of the structure and properties of engineering materials, their improvement and development of new materials and processes for their manufacture;
- Construction of mathematical models computer modelling to solve the problem;
- Measurements and research in the development of new materials and technologies in mechanical engineering for a given procedure with a choice of modern technology and computer processing of the results;
- -In the area of the settlement and the design and analysis:
- The formulation of goals and objectives of the project (program) in the issued criteria, the objective function, constraints, the construction of the structure of their relationships, identifying priority problem solving;
- Development of generalized solutions to the problems, the analysis of these options, predict consequences, finding compromise solutions in a multicriteriality, uncertainty, planning and implementation of projects;
- The development of projects of engineering equipment based on mechanical, technological, design, performance, ergonomic, aesthetic and economic parameters;
- The use of information technology for the selection of materials and equipment needed in the manufacture of finished products;
- In the field of industrial and technological activities:
- conducting physical and experimental studies using modern techniques for measuring and processing the results;
- the introduction of production processes, quality control of components and assemblies for different purposes;
- calculation of production standards, technological standards in the flow of materials, tools, selection of standard equipment, preliminary assessment of the economic efficiency of operations;

- the development of technical specifications for the construction of individual units devices, equipment and special tools;
- efficient use of materials and equipment selection and calculation of parameters of technological processes for the preparation of the finished product;
- standardization and certification of engineering equipment and processes and in their manufacture and repair;
- environmental control of production;

participation in work on fine-tuning and development of technological processes in the manufacture of products of the process engineering industry sector;

in service - operating activities:

- commissioning, testing and utilization of devices, systems and complexes related to the professional activity;

in the field of installation and commissioning activities:

- Installation, commissioning and testing of instruments, equipment and systems;
- Implementation of commissioning, configuration and pilot testing of certain types of devices and systems in the laboratory and at the sites;

in the field of organizational and managerial activities:

- Participation in the organization of work, aimed at the formation of the creative nature of the production teams;
- Development plans for various kinds of works and control of their implementation, including the provision of appropriate services necessary technical documentation, materials and equipment;
- Finding optimal solutions while working to meet the requirements of quality, cost, deadlines, competitiveness and security of life and reliability;
- Technical equipment and organization of jobs;
- Carry out technical control works;
- in the field of software and management activities:
- designing process control programs to create new metals and mining and oil and gas machines and equipment;
- Computer choice of materials and equipment for production of finished steel and mining and oil and gas machines and equipment production;
- the use of computer technology to geoinformatic systems;
- Information provision devices and systems.
- in the field of educational and teaching activities:

- Providing high-quality transmission of skills, knowledge and skills to work with the staff during their training.

The main requirements for the social and ethical competencies of graduates are:

- Know the social and ethical values based on public opinion, traditions, customs, social norms, and be able to navigate in them in their professional activities;
- To know the traditions and culture of people of Kazakhstan;
- Know the basics of the legal system and legislation in Kazakhstan;
- To know the trends of social development;
- Respect the rules of business ethics, own ethical and legal standards of conduct;
- Be able to adequately orient in different social situations;
- Be able to work in a team and defend their point of view;
- To strive for professional and personal growth.

Requirements for the economic, organizational and managerial competencies.

Graduate have to:

- Have the basics of economic knowledge, have a scientific understanding of the management, marketing, finance, etc.;
- It is able to develop the right strategy to achieve the objectives to achieve the best end result;
- Be able to express and justify their position on the choice of methods for solving tasks;
- Be able to analyze arise in solving this problem the economic situation and to choose the optimal from an economic point of view, a strategy;
- Possess organizational skills, be able to create mobile working groups to carry out their goals and be able to manage such a group, be able to defend their rights and to require them to perform the duties;
- Be able to take responsibility for decisions and to defend its position on the organizational and administrative activities.
- Know and understand the objectives and methods of state regulation of the economy;
- To know the basic rules and norms of scientific management.

In 2013, the state was conducted certification of the Kazakh National Technical University named after KI Satpayev degree program of bachelor and master 5B072400 - technological mashines and equipment "(by industry) and 6M072400 - Technological mashines and equipment" (by industry).

The content of the cycle of general disciplines is 25% of the total disciplines model curriculum or 33 credits and includes the following disciplines: History of Kazakhstan, Informatics, Basics of Life Safety, sociology, ecology and sustainable development, Kazakh (Russian) language, Foundations of Economic Theory, Foreign Language, Fundamentals of law, political science and philosophy, physical Culture.

After studying the cycle of general studies graduate should know:

- The history of the Republic of Kazakhstan, the stage of development of the state;
- The basic philosophical categories and concepts, Epistemological and ontological aspects of the consideration of human in philosophical sciences;
- Conceptual apparatus and the basic methods of sociology;
- Basic tendencies and concepts of modern science;
- The principles of evolution, reproduction and development of living systems of the biosphere and neosphere;
- The theoretical basis and methods of mathematics, elements of the theory of sets, the theorem of probability, mathematical statistics;
- Know the state, Russian and foreign languages at the level providing scientific communication;

**Term: 1 Semester: Fall Cycle of basic disciplines:**

Required component														
BD	1.1.1	IFN 5201	History and philosophy of science	2	3	1	0	1	1/0/1/2	2	2	Y		SD
BD	1.1.2	IYa 5202	Language for Special Purposes	2	3	0	0	2	0/0/2/2	2	2	Y		For.Lang
BD	1.1.3	Ped 5203	Pedagogy	2	3	1	0	1	1/0/1/2	2	2	Y		SD
BD	1.1.4	Psi 5204	Psychology	2	3	1	0	1	1/0/1/2	2	2	Y		SD
Electives														
BD	1.2.1.1	NPGTKSU 5205	Scientific problems of mining-transport complexes and stationary installations	3	5	2	0	1	2/0/1/3	3	3	Y		
BD	1.2.1.2	NPDOGM 5205.1	Research and practical achievements in mining machinery manufacturing	3	5	2	0	1	2/0/1/3	3	3	Y		



J Learning Objectives and Curricula of the degree programmes

PD	2.2.1.1	MISGMS 5301	International technical standards in mining machinery manufacturing	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.1.2	LAFGM 5301.1	Licensing and copyright in mountain mechanical engineering	3	5	2	0	0	1	2/0/1/3	3	3	Y						

Cycle of extra curricular educational disciplines

Required component																			
ECED		NI	Research work of master's	1	4	0	0	0	0	0/0/0/0	0	0							

Term: 1 Semester: Spring Cycle of basic disciplines

Electives																			
BD	1.2.2.1	MMNIGM 5206	Methodology and methods of scientific study in mining machinery manufacturing	3	5	2	0	0	1	2/0/1/3	3	3	Y						
BD	1.2.2.2	NPSTMO 5206.1	Scientific problems of creation of technological machines and facilities	3	5	2	0	0	1	2/0/1/3	3	3	Y						
BD	1.2.3.1	TOPKGMMSU 5207	Theoretical bases of design and construction of mining machines and systems of management	3	5	2	0	0	1	2/0/1/3	3	3	Y						
BD	1.2.3.2	ONIROKRGM 5207.1	Organization of R&D in mining machinery manufacturing	3	5	2	0	0	1	2/0/1/3	3	3	Y						
BD	1.2.4.1	MMNI 5208	Research methodology and methods	3	5	2	0	0	1	2/0/1/3	3	3	Y						
BD	2.2.4.2	RSOGMSU 5208.1	Repair and maintenance services of mining machines and systems of management	3	5	2	0	0	1	2/0/1/3	3	3	Y						

Cycle of professional disciplines

Required component																			
PD	2.1.1	MNI5302	Methodology of scientific researches	2	3	1	0	0	1	1/0/1/2	2	2	Y						

Electives																			
PD	2.2.2.1	ODNGMSU 5303	Operational diagnostics and reliability of mining machines and systems of management	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.2.2	MPRPGMSU 5303,1	Methodological principles and solutions for design of mining machines and stationary equipment	3	5	2	0	0	1	2/0/1/3	3	3	Y						

Cycle of extra curricular educational disciplines

Required component																			
ECED	1	IP	Research Practice	3	12	0	0	0	0	0/0/0/0	0	0							
ECED	2	NIRM	Research work of master's	1	4	0	0	0	0	0/0/0/0	0	0							

Term: 2 Semester: Fall Cycle of professional disciplines

Electives																			
PD	2.2.3.1	MSI6304	Technique of an assessment of knowledge being trained at credit	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.3.2	PION6304.1	Planning and organization of scientific research	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.4.1	MMI6305	Mathematical methods in engineering	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.4.2	MRP6305.1	Modeling workflow mining machines and stationary applications	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.5.1	ENGM6306	The operational reliability of mining machines and stationary applications	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.5.2	OUNP6306.1	Organization and management of knowledge-intensive industries	3	5	2	0	0	1	2/0/1/3	3	3	Y						
PD	2.2.6.1	IGM6307	Innovation in Mining Engineering	2	3	1	0	0	1	1/0/1/2	2	2	Y						
PD	2.2.6.2	ITTN6307.1	Innovative technologies and equipment for subsurface	2	3	1	0	0	1	1/0/1/2	2	2	Y						
PD	2.2.7.1	MPTD6308	Methods of teaching technical subjects in higher education	3	5	2	0	0	1	2/0/1/3	3	3	Y						

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PD	2.2.7.2	RKP6308.1	Calculation of design value of mining and transportation machines and stationary equipment	3	5	2	0	0	1	2/0/1/3	3	3	Y							
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Cycle of extra curricular educational disciplines

Required component																			
ECED	1	NIRM	Research work of master's	1	4	0	0	0	0	0/0/0/0	0	0							
ECED	2	PodP	Pedagogical practice	3	3	0	0	0	0	0/0/0/0	0	0							

Term: 2 Semester: Spring Cycle of extra curricular educational disciplines

Required component																			
ECED	4	NIRM	Research work of master's	4	16	0	0	0	0	0/0/0/0	0	0							

Required component																			
GAK	3	KE	A complex examination	1	4	0	0	0	0	0/0/0/0	0	0							

Required component																			
DPRW	5	OZMD	Master's Thesis Processing and Defense	3	11	0	0	0	0	0/0/0/0	0	0							

Director of Education Affairs Department

Saparov A.K

Head of Chair:

Iskakov B.