



ASIIN Seal & EUR-ACE Label

Accreditation Report

Bachelor's Degree Programme

***Operations and Service Engineering / Technological
Machines and Equipment,***

Master's Degree Programme

***Digital engineering of machinery and equipment /
Technological machines and equipment***

Provided by

**Kazakh National Research Technical University
named after K.Satbayev**

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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 ¹	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) ²
Эксплуатационно-сервисная инженерия / Технологические машины и оборудование (бакалавриат)	Operations and Service Engineering / Technological Machines and Equipment (Bachelor's Degree)	ASIIN, EUR-ACE® Label	01.07.2016 - 30.09.2021	TC 01
Цифровая инженерия машин и оборудования / Технологические машины и оборудование (магистратура)	Digital engineering of machinery and equipment / Technological machines and equipment (Master's degree)	ASIIN, EUR-ACE® Label	01.07.2016 - 30.09.2021	TC 01
<p>Date of the contract: 2021-07-05</p> <p>Submission of the final version of the self-assessment report: 28.08.2021</p> <p>Date of the onsite visit: 2-4 March 2022</p> <p>at: online</p>				

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

² TC: Technical Committee for the following subject areas: TC 01 - Mechanical Engineering/Process Engineering; TC 02 - Electrical Engineering/Information Technology; TC 03 - Civil Engineering, Geodesy and Architecture; TC 04 - Informatics/Computer Science; TC 05 - Materials Science, Physical Technologies; TC 06 - Engineering and Management, Economics; TC 07 - Business Informatics/Information Systems; TC 08 - Agriculture, Nutritional Sciences and Landscape Architecture; TC 09 - Chemistry; TC 10 - Life Sciences; TC 11 - Geosciences; TC 12 - Mathematics; TC 13 - Physics.

Peer panel: Prof. Alina Kim, D. Serikbayev East Kazakhstan State Technical University Prof. Dr. Wolfgang H. Mueller, Technical University Berlin Dr. Olaf Neitzsch, Olaf Neitzsch Consulting Carsten Schiffer (student), RWTH Aachen	
Representatives of the ASIIN headquarter: Dr. Michael Meyer	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 01 – Mechanical Engineering/Process Engineering as of December 9, 2011;	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
6B07107 - Operational and service engineering / 5B072400 - Technological machines and equipment (bachelor's degree)	Bachelor of Engineering and Technology	1. Mining machinery and equipment 2. Metallurgical machinery and equipment 3. Machinery and equipment of the oil and gas industry	Level 6	Full-time	1. Silesian Technical University, Poland; 2. Magnitogorsk State Technical University G. I. Nosova, Russia; 3. Federal State Autonomous Educational Institution of Higher Education "National Research Technological University" MISiS" Russia; 4. Moscow Automobile and Highway State Technical University, Moscow, Russia	4 years, 8 semesters	242 credits	autumn
7M07111 - Digital engineering of machines and equipment / 6M072400 - Technological machines and equipment (master's degree)	Master of Engineering Science	1. Mining machinery and equipment 2. Metallurgical machinery and equipment 3. Machinery and equipment of the oil and gas industry		Full-time		2 years, 4 semesters	124 credits	autumn

For both programmes the institution has presented the following general objectives in the self-assessment report:

Graduated bachelors and masters must have in-depth knowledge and skills in the field of machinery and equipment for the mining and metallurgical and oil and gas industries. Specialists must have practical experience based on the study of basic and specialized disciplines, and the study of techniques and technologies during the passage of all types of practices. They should have the knowledge and skills to analyze technology and technology and identify existing problems. Specialists should be able to develop equipment designs taking into account mechanical, technological, design, operational, ergonomic, aesthetic and eco-

³ EQF = The European Qualifications Framework for lifelong learning

conomic parameters. Professionals should be competent in conducting experimental research and in planning and implementing projects. Masters must master the techniques of pedagogical activity and master's.

Bachelors and Masters must have communication and skills to be able to present their ideas and information, orally and in writing. The specialist must be able to present graphical information in the form of figures, tables, slides and drawings. He must be competent in the search and interpretation of technical information using various search engines (patent search, literature review of journals and books, the Internet).

Bachelors and masters must be socially mobile, be able to adapt to new situations in the professional environment. The specialist must have the ability to perceive diversity and intercultural difference, to appreciate a variety of approaches to understanding and solving problems of society.

Bachelors and masters should be able to organize teamwork, show creativity and breadth of interests to solve interdisciplinary problems. The professional must be tolerant, capable of criticism and self-criticism and be prepared to accept the role of team leader and possess the skills of interaction and cooperation. A bachelor-mechanic must have an ethical education and continue his development through self-improvement and learning throughout life.

Bachelors and masters must know Kazakh, Russian and English well, be able to work in the international community. The specialist must have good communication skills, appreciate the traditions of other cultures, their diversity in modern society.

Bachelors and masters must have: fundamental basic education, economic, social and legal training. A Bachelor of Mechanics must know and support the rules of ethics in society, at work and in interpersonal communication. They must demonstrate skills in achieving goals, solving problems and finding non-standard solutions. Specialists should show concern for the protection of the environment and improve their skills to serve the development of the well-being of the whole society.

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

Graduates

have an idea:

on the main scientific and technical problems and the current state of technological machines for various industrial purposes;

on the principles of designing technological machines using computer technology;

on the structure of technological equipment and its functional purpose;

on packages of applied programs in the field of designing technological machines and equipment;

on the system of legislative acts, methods and means of ensuring healthy and safe working conditions at industrial enterprises;

know:

the foundations of the Constitution of the Republic of Kazakhstan, ethical and legal norms governing industrial relations;

basic rights and obligations of the maintenance personnel of technological machines and equipment;

basic requirements for the rational and safe conduct of work related to the use of technological machines and equipment;

principle of operation and design of technological equipment;

methods of ensuring environmental safety during the operation of technological machines and equipment;

requirements and content of design and technical documentation for the operation of technological equipment;

the economy of the enterprise and industry, the scientific organization of labor;

a foreign language for studying foreign experience in professional activities, as well as for making contacts at a professional level;

are able to:

carry out basic calculations of the main parameters of technological machines, justify their choice depending on the production levels;

carry out calculations of units and parts of technological equipment and develop a schedule for their repair;

assess the impact of the operation of technological equipment on the environment;

analyze production indicators and substantiate proposals for improving the structure and organization of production management;

to logically consistently and reasonably express thoughts;

have skills:

using the basic provisions of social, humanitarian, economic sciences and professional disciplines in solving social and professional problems;

the use of modern research methods in the modeling of technological processes;

application of basic regulatory documents for the operation of technological machines and equipment;

in the organization of safe working conditions and the elimination of accidents;

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

The goal (mission) of the EP magistracy in the direction of training 7M07111 "Digital engineering of machines and equipment" / 6M072400 - Technological machines and equipment (magistracy) proclaims the training of a specialist who has:

- a set of personal qualities, scientific, pedagogical and professional competencies sufficient for the formation in the country (region) of modern digital technical engineering for the maintenance and service industry and advanced organization of production activities;
- the ability to reasonably combine the commercial principles of business activities, the satisfaction of public needs in the services of enterprises of the oil, mining and metallurgical industries with the humanitarian tasks of personnel development and social values of Kazakhstani society.
- a high level of theoretical training in the field of socio-cultural, economic, legal and professional disciplines, taking into account the trends of modern scientific, pedagogical and professional social development, the inclusion in the educational process of leading domestic and foreign specialists in the field of services in technology;
- high level of language training;
- development of skills in design and research activities, implementation of projects aimed at the practical application of modern professional digital techniques and technologies for organizing the activities of oil, mining and metallurgical enterprises;
- the optimal ratio in the educational process of theoretical and practical training (due to the purposeful organization of research and production practices);
- personality-oriented approach to the educational process, focused on developing a responsible attitude to the results of their professional activities;

B Characteristics of the Degree Programmes

aspect of self-development, where the emphasis is placed on the organization of professional activities, within which the master's student is focused on continuous professional self-improvement.

C Peer Report for the ASIIN Seal⁴

1. The Degree Programme: Concept, content & implementation

Criterion 1.1 Objectives and learning outcomes of a degree programme (intended qualifications profile)

Evidence:

- Self-Assessment Reports
- Study plans of the degree programmes
- Module descriptions
- Webpage of all study programmes
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors base their assessment of the learning outcomes as provided on the websites and in the Self-Assessment Reports of the three Bachelor's degree programmes under review. They refer to the Subject-Specific Criteria (SSC) of the respective Technical Committee for Mechanical Engineering.

The peers come to the following conclusions:

Graduates of the Bachelor's degree programme should gain extensive technical knowledge as to engineering, mathematics and natural science with a view to mechanical engineering and an understanding of the multi-disciplinary context of Engineering Sciences. In the formulated objectives of the university, the peers recognise that graduates should be qualified to identify, formulate and solve problems peculiar to mechanical engineering, to analyse and assess products, processes and methods used in their discipline and to choose suitable methods of analysing, modelling, simulating and optimising and apply them. Additionally the peers recognise that graduates should have the ability the ability to conceive designs for machinery, devices, EDP programmes or processes and to develop them according corresponding to the status of their knowledge. Regarding transferable skills graduates should

⁴ 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.

be able to work in teams, to communicate effectively and to be aware of the health, safety, legal issues and responsibilities of engineering practice and of the impact of engineering solutions in a societal and environmental context.

For the Master's degree programme peers recognise that graduates should get consolidated knowledge of mathematic-scientific and engineering principles of mechanical engineering and a critical awareness of the newest findings in their discipline. They should be able to analyse and solve problems scientifically by using innovative methods of their discipline. They should be qualified to develop solutions for partially unusual problems and apply their scientific ability to judge in order to work with complex, technologically impure or incomplete information. The university also have in mind, that graduates should be able to assess applicable techniques based on their imminent knowledge and to assess their limits as well as to recognise non-technical effects of engineering activities systematically. Graduate should be able to work as team leader and to work in international context.

The auditors hold the view that the objectives and intended learning outcomes of both degree programmes under review are reasonable and well founded. They learn that various stakeholders (alumni, industrial and governmental representatives) are involved in the constant review and development of the curricula. For example, industrial representatives are regularly invited to give suggestions on the skills and expertise graduates must possess.

In summary, the auditors are convinced that the intended qualification profiles of both programmes under review allow students to take up an occupation, which corresponds to their qualification. The peers conclude that the objectives and intended learning outcomes of the degree programmes adequately reflect the intended level of academic qualification and correspond sufficiently with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 01 – Mechanical Engineering

Criterion 1.2 Name of the degree programme

Evidence:

- Academic Handbook
- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors confirm that the English translation and the original Russian/Kazakh names of the degree programmes under review correspond with the intended aims and learning out-

comes as well as the main course language (Russian/Kazakh). Nevertheless, they find various English translations of the original titles in different documents which have to be used consistently.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Reports
- Study plans of the degree programmes
- Module descriptions
- Webpages of all study programmes
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The Curriculum of the bachelor's degree programme contents in the first four semesters fundamentals of mathematics, natural sciences and engineering fields (Algebra, Calculus I-III, MathLab, Physics I-III, Engineering and Computer Graphics, Construction materials, Information and Communication Technologies, welding and cutting of metals, basic hydraulics, Theoretical Mechanics). Additionally, there are different modules regarding non technical aspects like Kazakh history, philosophy, social and political knowledge as well as four modules about English language.

In the second half of the programme there are only a few compulsory courses in ordinary and partial differentiation, automation and exploitation, installation and reparation of machines. Additionally, students choose one out of the three specialisations in metallurgical machines and equipment, mining machines and equipment or machines and equipment of the oil and gas industry. For each specialisation a separate catalogue of elective courses is defined. There are no compulsory courses within the specialisations. During the last two semesters a project is implemented which students become familiar with scientific writing.

The curriculum of the master's degree programme contents compulsory courses in installation and commission methods for machines, maintenance of machines, installation property protection, innovative drives of machines, monitoring and diagnosing of machines. Additionally students complete four research projects and as non-technical courses a module foreign language, history and philosophy, management psychology and licensing and copyright. For the education part a module about school pedagogy and pedagogical practice is implemented. Finally, students choose one out of the three specialisations in metallurgical machines and equipment, mining machines and equipment or machines and equipment of the oil and gas industry.

From the point of view of the peers both programmes are structured very well. The curricula implement all the defined study aims and learning outcomes. Especially the panel appreciates the broad range of elective courses offered to the students. Several modules include activities to train communication skills and teamwork.

Due to the high number of elective courses, they also appreciate that there is an advisory system to inform students about the offered elective courses and to advise them which modules would fit best with their interests.

Although there are four modules about English language implemented in the bachelor's curriculum, after the discussion with the students the peers get the impression that their English skills could be increased, for example by teaching technical courses in English as well.

Out of the discussion with representative of the industry the peers got the impression that graduates of the programmes are very well prepared for the national labor market regarding their field specific competences.

Overall the peers come to the conclusion that the curricula of both programmes implement the intended learning outcomes in a very good manner. From their point of view the curricula are linked to the actual field specific research discussions and students are well prepared for activities regarding the design, installation, commissioning, maintenance, operation, diagnostics and repair of technological machines and equipment.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Reports
- Decree of Minister of Education and Science May 24, 2021, No. 241
- Discussions during the audit

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Reports, admission procedures and policies for new students follow the National Regulation No.241. The requirements, schedule, registration venue, and selection test are announced on the webpage and thus accessible for all stakeholders.

There are different ways by which students can be admitted to a Bachelor's programme depending on the type of grant they hold. In case more students than places are available

apply for a programme a so-called express-testing is implemented with exams and oral testing.

Enrolment in the master programme depends on the results of national centralised test including a test in a foreign language (optional English, German, French), a test in the discipline applied for and a test to determine the readiness to study optional in Kazakh or Russian.

In summary, the auditors find the terms of admission to be binding and transparent. They confirm that the admission requirements support the students in achieving the intended learning outcomes.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:

The structure of the programmes under review is clearly outlined on the subject specific website for each study programme. The programmes consists of modules, which comprise a sum of teaching and learning. The module descriptions are also published on the subject specific website. Based on the analysis of the sequence of modules and the respective module descriptions the peers concluded that the structure of both programmes ensures that the learning outcomes can be reached. The programmes also offers several elective courses, which allows students to define an individual focus. Based on the analysis of the curriculum and the module descriptions the peers confirmed that the objectives of the

modules and their respective content help to reach both the qualification level and the overall intended learning outcomes.

In order to support the international mobility of students the faculty has established several student exchange programmes with international, mainly Russian universities but also with Higher Education Institutions in Poland and Indonesia. For the recognition of courses finished abroad Satbayev University has defined transparent regulations. The peers appreciate that students are very interested in the exchange programmes and that there is a high student demand. They comprehend the students' wish about international lecturers in order to get impressions that are more international and to get even better prepared for the international labor market.

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

To define the student workload the university uses the ECTS credit point system taking into account the time for lectures and self-studies. Regarding the objectives and the content of the single modules, the calculated workload seems to be appropriate and students confirm this impression in general.

The peers wonder why the bachelor programme is defined with 242 ECTS points and the master degree programme with 124 credits instead of 240 and 120 ECTS points as. Programme coordinators mentioned that in general the programmes are calculated with 240 and 120 ECTS points but by choosing elective courses there could be an increased workload. The mentioned credits are the maximum number students can reach in the programmes.

The peers also remark inconsistencies regarding the total workload of the programmes in different documents like SAR and curricular overview. As they learned this are editorial mistakes after the workload was recalculated. Not transparent seems the workload calculation in the module descriptions as well, where obviously, only the contact hours are defined but not the self-study time of the students. From the point of view of the peers the

university has to ensure that the workload calculation for the ECTS Credit Point System is consistently in all documents and transparent for all stakeholders.

The peers appreciate that students are involved in the calculating of the workload and that they have the opportunity for a feedback about the workload after finishing the course.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Reports
- Study plans of the degree programmes
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Various teaching and learning methods (including lectures, computer training and classroom and lab exercises, individual and group assignments, seminars and projects, etc.) have been implemented. Structured activities include tutorials, homework, assignments (reading or problem exercises) and practical activities. Group project assignments are given in some courses to develop students' skills in teamwork, communication, and leadership. The assignments and exercises should help students to develop their abilities with respect to critical thinking, written/oral communication, data acquisition, problem solving, and presentations.

The most common method of learning is class session, with several courses having integrated laboratory practices. Lecturers generally prepare presentations to aid the teaching process. With individual or group assignments, such as discussions, presentations, or written tasks, students are expected to improve their academic as well as their soft skills. Laboratory work covers laboratory preparation, pre or post-tests, laboratory exercises, reports, discussions, and presentations. In addition, practical activities should enable students to be acquainted with academic research methods.

Courses are taught in Russian and/or Kazakh and in the master programme three modules are taught in English.

In summary, the peer group considers the teaching methods and instruments to be suitable to support the students in achieving the intended learning outcomes. In addition, they confirm that the study concept of all three undergraduate programmes comprises a variety of teaching and learning forms as well as practical parts that are adapted to the respective subject culture and study format. It actively involves students in the design of teaching and learning processes (student-centred teaching and learning).

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Reports
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Besides the field specific advisory system by the lecturers, the university offers support in medical and social belongings for the students. Also a career center is implemented at the university and dormitories are available for students.

The peers appreciate that in the discussion students praise the supporting system at the university and especially the availability of the teaching staff.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report
- Module descriptions
- Examination regulations

Preliminary assessment and analysis of the peers:

According to the Self-Assessment Report, the students' academic performance is evaluated based on their attendance and participation in class, their laboratory works and reports, assignments, homework, project works, presentations, mid-term exam, and the final exam at the end of each semester. In general, exams are written tests. But in several courses also oral presentations of lab reports or homework are required. In addition, group discussions and practical exams in courses with high laboratory practice are conducted. In several courses students have to pass laboratory practice before entering the final exam. The form and length of each exam is mentioned in the module descriptions.

The students are informed about mid-term and final exams via the Academic Calendar. The final grade is the result of the different activities in the course.

If a student fails, he has to repeat the entire module in the following semesters; it is not possible to retake just parts of the course or to just retake the final exam. Within one week after the grade is published students have the opportunity to appeal or to ask about the assessment. In case of different opinions more lecturers could be invited to discuss the results.

The students appreciate that there are several short exams instead of one big exam and confirm that they are well informed about the examination schedule, the examination form, and the rules for grading. From the point of view of the students the requirements in the exams are hard but fair.

The peers also inspect a sample of examination papers and final theses and are overall satisfied with the general quality of the samples. The requirements in the exams, projects and theses correspond for the auditors with the qualification level of the two programmes.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

4. Resources

Criterion 4.1 Staff

Evidence:

- Self Assessment Report
- Staff handbook
- Discussions with programme coordinators and teaching staff

Preliminary assessment and analysis of the peers:

At Satbayev University, the staff members have different academic positions. There are professors, associate professors, assistant professors and lecturers. The academic position of each staff member is based on research activities, publications, academic education, supervision of students, and other supporting activities.

The quantity of teaching staff is calculated on an average student teacher ratio of 16/1 in accordance with the regulations of the Minister of Education and Science.

Professors are supported by the university to spend some time abroad to attend conferences, workshops or seminars; even a sabbatical leave is possible. Regarding internationalisation, the peers determined that the professors mostly are engaged in research projects in Russian speaking countries and encourage the teaching staff to cooperate in research activities with Western Universities as well. Over all the peers see a appropriate network of the university and the department with national and international research institutions.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report
- Staff handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:

Satbayev University encourages the training of its academic and technical staff, so it has developed a programme for improving the didactic abilities and teaching methods. One part of the capacity-building programme focuses on subject-specific skills, whereas other training courses are intended to further improve the teachers' didactic skills and to introduce new teaching methods. There are financial resources available for staff members to go abroad for a limited time and to take part at conferences or other events in order to stay up to date with the scientific development in their area of expertise.

The peers discuss with the members of the teaching staff the opportunities to develop their personal skills and learn that the teachers are satisfied with the internal qualification programme, their opportunities to further improve their didactic abilities.

In summary, the auditors confirm that the university offers sufficient support mechanisms and opportunities for members of the teaching staff who wish to further develop their professional and teaching skills.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report
- Discussions with programme coordinators and teaching staff
- digital visit of the laboratories, lecture rooms, and the library

Preliminary assessment and analysis of the peers:

The peers were explained that financial sources for the university is originated from government funding, society funding, and tuition fees. The operational funds were distributed to the Faculties based on a specific formula depending on the number of students. The salary for staff members included a basic salary from government and incentives depending on additional efforts of staff members. The financing of the equipment is ensured also by external funds (third party money).

The peers were convinced that the financial means were sufficient and secured for the timeframe of the accreditation. The equipment of the labs ensures to conduct the education in the programmes in the defined way. For research activities of the professors the labs seem to be still sufficient with space for improvement.

From the student the peers learn that they have online access to national and international literature and that the inventory of the library was improved in the last years and now it is well equipped.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

5. Transparency and documentation

Criterion 5.1 Module descriptions
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Evidence:

- Self-Assessment Report
- Module descriptions

Preliminary assessment and analysis of the peers:

The students, as all other stakeholders, have access to the module descriptions via universities homepage.

After studying the module descriptions, the peers confirm that they include all necessary information about the persons responsible for each module, the teaching methods and work load, the awarded credit points, the intended learning outcomes, the content, the applicability, the admission and examination requirements, and the forms of assessment and details explaining how the final grade is calculated. They remark that it would be easier

for students to find the description if the module codes and titles would be named in the module descriptions and the curricular overview as well.

As the panel learns that missing forms of exams in some descriptions are editorial mistakes they recommend to update the module descriptions regularly.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Self-Assessment Reports
- Sample Diploma for each degree programme
- Sample Diploma Supplement for each degree programme

Preliminary assessment and analysis of the peers:

The peers confirm that the students of all degree programmes under review are awarded a Diploma and a Diploma Supplement after graduation. But they determine that the sample of the Diploma Supplement is more a transcript of records than a supplement as there are missing some basic information regarding the programmes. Therefore the peers find it necessary that the diploma supplement contains detailed information about the educational objectives, intended learning outcomes as well as about the educational system of Kazakhstan and statistical data according to the ECTS-Users' guide in addition to the final grade.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Reports
- All relevant regulations as published on the university's webpage

Preliminary assessment and analysis of the peers:

The auditors confirm that the rights and duties of both UB and the students are clearly defined and binding. All rules and regulations are published on the university's website and hence available to all stakeholders. In addition, the students receive all relevant course material in the language of the degree programme at the beginning of each semester.

Nevertheless, the peers determine several editorial mistakes within the examination rules and – as mentioned before – the English translation of the programme titles change in different documents.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Reports
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The auditors discuss the quality management system at Satbayev University with the programme coordinators and the students. They learn that there is a continuous process in order to improve the quality of the degree programmes and it is carried out through internal and external quality assurance.

All programmes at KazNRTU are regular part of internal quality assessment procedures of the Management and Quality System which is certified in accordance with International Quality Standards ISO 9001. This includes besides internal audits also evaluations of the single courses by students. The result of the student evaluations are taken into account for the further development of the programmes. Student confirm to the peers that they get a feedback about the results. Partners from industry also are regularly involved in the programme evaluations regarding the needs of the labor market.

The auditors gain the impression that the Departments take the students' feedback seriously and changes are made if necessary. The panel confirms that the quality management system is suitable to identify weaknesses and to improve the degree programmes.

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

As the university abstain from commenting the report, the peers confirm their preliminary assessment.

D Additional Documents

No additional documents needed.

E Comment of the Higher Education Institution

The university abstains from commenting the report.

F Summary: Peer recommendations

The peers recommend the award of the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Operations and Service Engineering / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027
Ma Digital engineering of machinery and equipment / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027

Requirements

For both degree programmes

A 1 (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes as well as about the educational system of Kazakhstan and statistical data according to the ECTS-Users' guide in addition to the final grade.

A 2 (ASIIN 5.3) Ensure consistent information about the programmes in all documents, especially regarding the credit points and the English translation of the programme titles.

A 3 (ASIIN 5.3) Ensure that the workload calculation for the ECTS Credit Point System is consistently in all documents and transparent for all stakeholders.

Recommendations

For both degree programmes

E 1. (ASIIN 1.3) It is recommended to offer more technical courses in English.

E 2. (ASIIN 5.1) It is recommended to update the module descriptions regularly.

G Comment of the Technical Committee

The Technical Committee discusses the procedure and follows the assessment of the peers without any changes.

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Operations and Service Engineering / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027
Ma Digital engineering of machinery and equipment / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027

H Decision of the Accreditation Commission

The Accreditation Commission discusses the procedure and follows the assessment of the peers and of the Technical Committee without any changes.

The Accreditation Commission decides to award the seals as follows:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Operations and Service Engineering / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027
Ma Digital engineering of machinery and equipment / Technological Machines and Equipment	With requirements	EUR-ACE	30.09.2027

Requirements

For both degree programmes

- A 1 (ASIIN 5.2) Ensure that the Diploma Supplement contains detailed information about the educational objectives, intended learning outcomes as well as about the educational system of Kazakhstan and statistical data according to the ECTS-Users' guide in addition to the final grade.
- A 2 (ASIIN 5.3) Ensure consistent information about the programmes in all documents, especially regarding the credit points and the English translation of the programme titles.
- A 3 (ASIIN 5.3) Ensure that the workload calculation for the ECTS Credit Point System is consistently in all documents and transparent for all stakeholders.

Recommendations

For both degree programmes

- E 3. (ASIIN 1.3) It is recommended to offer more technical courses in English.
- E 4. (ASIIN 5.1) It is recommended to update the module descriptions regularly.

Appendix: Programme Learning Outcomes and Curricula

According to the SAR the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme:

Graduates must solve the following tasks in accordance with the types of professional activity:

in the field of settlement, design and analytical activities:

formulation of tasks and goals of the project (program) with the issued criteria, target functions, restrictions, building the structure of their relationships, identifying priorities for solving problems;

development of generalized options for solving problems, analyzing these options, predicting the consequences, finding compromise solutions in conditions of multi-criteria, uncertainty, planning and implementing projects;

development of projects for mining and metallurgical and oil and gas equipment, taking into account mechanical, technological, design, operational, ergonomic, aesthetic and economic parameters;

use of information technology to select the necessary materials and types of equipment in the manufacture of finished products;

in the field of production and technological activities:

carrying out physical and experimental research using modern methods of measuring and processing the results;

introduction of technological processes of mining and metallurgical and oil and gas production, quality control of elements and units of technological machines for various purposes;

calculation of production rates, technological standards for the consumption of materials, tools, selection of standard equipment, preliminary assessment of the economic efficiency of work;

development of technical specifications for the design of individual units of machinery and equipment, tooling and special tools;

effective use of materials and equipment, selection and calculation of parameters of technological processes for the preparation of finished products;

standardization and certification of mining and metallurgical and oil and gas machinery and equipment during their manufacture and repair;

environmental control of mining and metallurgical and oil and gas machinery and equipment;

participation in works on fine-tuning and development of technical processes in the course of technological preparation of production of products of the machine-building industry;

in the field of service and operational activities:

adjustment, testing and disposal of mining and metallurgical and oil and gas machinery and equipment, systems and complexes related to professional activities;

in the field of installation and commissioning:

installation, adjustment and testing of mining and metallurgical and oil and gas machinery and equipment;

commissioning, tuning and pilot testing of certain types of mining and metallurgical and oil and gas machinery and equipment;

in the field of organizational and management activities:

participation in the organization of work aimed at the formation of the creative nature of the activities of production teams;

development of plans for various types of work and control of their implementation, including the provision of relevant services with the necessary technical documentation, materials and equipment;

finding optimal solutions when performing work, taking into account the requirements of quality, cost, deadlines, competitiveness and life safety and reliability;

technical equipment and organization of workplaces;

implementation of technical control of work performance;

in the field of program management:

design of programs for the control of technological processes in the creation of new mining and metallurgical and oil and gas machinery and equipment;

computer selection of materials and equipment for obtaining finished mining and metallurgical and oil and gas machinery and equipment products;

application of computer technologies for geographic information systems;

information support of devices and systems.

in the field of educational and pedagogical activities:

ensuring high-quality transfer of skills, knowledge and abilities to work with personnel during their training.

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

know social and ethical values based on public opinion, traditions, customs, social norms and be able to navigate them in their professional activities;

know the traditions and culture of the peoples of Kazakhstan;

know the basics of the legal system and legislation of Kazakhstan;

know the tendencies of social development of society;

comply with the norms of business ethics, possess ethical and legal norms of behavior;

be able to adequately navigate in various social situations;

be able to work in a team and defend their point of view;

strive for professional and personal growth.

Requirements for economic and organizational and managerial competencies.

The graduate must:

have the basics of economic knowledge, have a scientific understanding of management, marketing, finance, etc.;

be able to develop the correct strategy for solving the assigned tasks in order to achieve the best end result;

be able to express and substantiate their position on the choice of methods for solving tasks;

be able to analyze the economic situation that arises when solving the task and choose the tactics that are optimal from an economic point of view;

have organizational skills, be able to create mobile working groups to fulfill the set goals and be able to manage such a group, be able to protect their rights and demand from them to fulfill their duties;

be able to take responsibility for making decisions and defend their position in organizational and management activities.

know and understand the goals and methods of state regulation of the economy;

The following **curriculum** is presented:

0 Appendix: Programme Learning Outcomes and Curricula



MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
SATBAYEV UNIVERSITY

APPROVED
Director of the Institute of Metallurgy and
Industrial Engineering

K.K. Yelemessov



MAJOR ELECTIVE DISCIPLINES for 2020-2021 academic year admission
6B07107 - "Operational Service Engineering"

Full-time study Study duration : 4 years Academic degree: bachelor of engineering and technology

Year of study	Code of elective	Code of discipline	Name of discipline	Cycle	Credits	lec/lab/pr/1 WS	Prerequisites
2 semester (spring 2021)							
1	1101	LNG1074	Business Kazakh language /Advanced Russian language (B2)	G	6	0/0/3/3	LNG1073
		LNG1075	Kazakh (Russian) language. Rhetoric (C1)				
		LNG1076	Kazakh (Russian) language. Culture of business communication (C1)				
Total:					6		
3 semester (fall 2021)							
2	2209	TEC169	Drives of mining machines and fixed installations	B	6	2/1/0/3	GEN146
		TEC430	Technique of field experiment			2/1/0/3	TEC193
		TEC148	Fuels, oils and special liquids			2/0/1/3	PHY111, GEN146
		PED414	Friction and wear			2/0/1/3	PHY111 GEN146
Total:					6		
4 semester (spring 2022)							
2	2108	LNG109	IELTS Preparation	G	6	0/0/3/3	LNG 1056
		LNG110	Intercultural Communication				
		LNG117	Technical Writing				
		LNG118	Public speaking				
		LNG119	Productivity skills				
		LNG120	GRE preparation				
	2215	PED114	Computer-aided design of technological machines.	B	6	1/2/0/3	PHY111, GEN101
		TEC118	Calculation and design of technological machines and equipment			1/2/0/3	PHY111, GEN101
		TEC403	Computer simulation of machine parts			1/2/0/3	PHY111, GEN101
		TEC409	Computer technologies for calculation, modeling and design			1/2/0/3	PHY111, GEN101
Total:					12		
5 semester (fall 2022)							
3	3217	MIN407	Open-cast mining technology	B	6	2/0/1/3	PHY112
		PED175	Auxiliary transport equipment of metallurgical workshops			2/0/1/3	PHY112
		PED445	Fundamentals of Research and Development			2/0/1/3	MAT102, PHY112
		PED446	Fundamentals of the theory of reliability of machines and mechanisms			2/0/1/3	MAT102, PHY112
		TEC410	Fundamentals of the theory of wear of machinery and equipment			2/0/1/3	MAT102, PHY112
	3218	TEC105	Mining machines and equipment	B	6	2/1/0/3	PHY112
		TEC153	Tool base of metallurgical enterprises			2/0/1/3	PED435
		TEC104	Drilling machines and complexes			2/0/1/3	PHY112, PED436
		TEC131	Machines and equipment for drilling oil and gas wells at sea			2/0/1/3	PHY112, PED436
		TEC404	Technical audit			2/0/1/3	PHY112
		TEC411	Equipment maintenance system			2/0/1/3	PHY112
	3219	TEC121	Transportation machines	B	6	2/1/0/3	PHY112
		PED141	Drives of metallurgical machines			2/0/1/3	PHY112
		TEC155	Technological processes in the oil and gas industry			2/0/1/3	PHY112, PED436
		TEC156	Technology of drilling wells and oil and gas production			2/0/1/3	PHY112, PED436
		TEC405	Technical aesthetics and ergonomics			2/0/1/3	PED436
	3301	TEC412	Material and technical means of repair work	S	6	2/0/1/3	PHY112
		MIN414	Development of mineral deposits			2/0/1/3	PHY112
		MIN173	Mining technology			1/0/2/3	PHY112
		TEC112	Equipment for ore preparation			2/1/0/3	TEC193
PED439		Basics of hydraulics and hydraulic drives of technological machines	2/0/1/3			PED436	
Total:					24		
6 semester (spring 2023)							
3	3220	TEC108	Pumps, fans, compressors	B	6	2/0/1/3	PHY112
		PED118	Dust-gas cleaning and recycling water supply of industrial enterprises			2/0/1/3	TEC112
		PED191	Gas-pumping units			2/0/1/3	PED436
		PED192	Gas turbine plants			2/0/1/3	PED436
		TEC413	Ways to restore and repair parts			2/0/1/3	PED436
Total:					6		
7 semester (fall 2023)							
4304		TEC177	Drain, fan and pneumatic installations	S	6	2/1/0/3	PHY112
		TEC141	The equipment of metallurgical shops			2/0/1/3	TEC112
		TEC109	Oil and gas field machines and mechanisms			2/0/1/3	PHY112, PED436
		TEC133	Machines and equipment for oil and gas production at sea			2/0/1/3	PHY112, PED436
4305		MIN416	Burro-blasting works	S	6	2/0/1/3	PHY112
		MIN415	Technology of mine workings			2/0/1/3	PHY112
		PED185	Technical diagnostics of metallurgical equipment			2/0/1/3	TEC180
		TEC127	Hydromachines and compressors in the oil and gas industry			2/0/1/3	PED413, PHY112
		TEC106	Machines and equipment for gas and oil pipelines			2/0/1/3	PED191
Total:					6		

According to the SAR the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master degree programme:

Graduates solve the following tasks in accordance with the types of professional activity:

in the field of experimental research:

analysis of the task of research in a given area based on the selection and study of literary and patent sources;

diagnostics of the state and dynamics of objects of activity (materials, technological processes, equipment in various industries using the necessary tools and methods of analysis;

study of the structure and properties of engineering materials, their improvement and the creation of new materials and technological processes for their manufacture;

building mathematical models, computer modeling to solve the problem;

carrying out measurements and research in the development of new materials and technologies in mechanical engineering according to a given method with the choice of modern technical means and computer processing of the results;

in the field of settlement, design and analytical activities:

formulation of tasks and goals of the project (program) with the issued criteria, target functions, restrictions, building the structure of their relationships, identifying priorities for solving problems;

development of generalized options for solving problems, analyzing these options, predicting the consequences, finding compromise solutions in conditions of multi-criteria, uncertainty, planning and implementing projects;

development of projects of mechanical engineering equipment, taking into account mechanical, technological, design, operational, ergonomic, aesthetic and economic parameters;

use of information technology to select the necessary materials and equipment in the manufacture of finished products;

in the field of production and technological activities:

carrying out physical and experimental research using modern methods of measuring and processing the results;

introduction of production processes, quality control of elements and assemblies for various purposes;

calculation of production rates, technological standards for the consumption of materials, tools, selection of standard equipment, preliminary assessment of the economic efficiency of work;

development of technical specifications for the design of individual units of devices, equipment and special tools;

effective use of materials and equipment, selection and calculation of parameters of technological processes for the preparation of finished products;

standardization and certification of machine-building equipment and technological processes and during their manufacture and repair;

environmental control of production; participation in work on fine-tuning and development of technical processes in the course of technological preparation of the production of products in the machine-building industry of the industry;

in the field of service and operational activities:

adjustment, testing and disposal of devices, systems and complexes related to professional activities;

in the field of installation and commissioning:

installation, adjustment and testing of devices, equipment and systems;

commissioning, tuning and pilot testing of certain types of devices and systems in laboratory conditions and on-site;

in the field of organizational and management activities:

participation in the organization of work aimed at the formation of the creative nature of the activities of production teams;

development of plans for various types of work and control of their implementation, including the provision of relevant services with the necessary technical documentation, materials, equipment;

finding optimal solutions when performing work, taking into account the requirements of quality, cost, deadlines, competitiveness and life safety and reliability;

technical equipment and organization of workplaces;

implementation of technical control of work performance;

in the field of program management:

designing programs for controlling technological processes when creating new materials;

computer selection of materials and equipment for the manufacture of finished engineering products;

application of computer technologies for geographic information systems;

information support of devices and systems.

in the field of educational and pedagogical activities:

ensuring high-quality transfer of skills and knowledge and the ability to work with personnel during their training.

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

know social and ethical values based on public opinion, traditions, customs, social norms and be able to navigate them in their professional activities;

know the traditions and culture of the peoples of Kazakhstan;

know the basics of the legal system and legislation of Kazakhstan;

know the tendencies of social development of society;

comply with the norms of business ethics, possess ethical and legal norms of behavior;

be able to adequately navigate in various social situations;

be able to work in a team and defend their point of view;

strive for professional and personal growth.

Requirements for economic and organizational and managerial competencies.

The graduate must:

have the basics of economic knowledge, have a scientific understanding of management, marketing, finance, etc.;

be able to develop the correct strategy for solving the assigned tasks in order to achieve the best end result;

be able to express and substantiate their position on the choice of methods for solving tasks;

be able to analyze the economic situation that arises when solving the task and choose the tactics that are optimal from an economic point of view;

have organizational skills, be able to create mobile working groups to fulfill the set goals and be able to manage such a group, be able to protect their rights and demand from them to fulfill their duties;

be able to take responsibility for making decisions and defend their position in organizational and management activities.

know and understand the goals and methods of state regulation of the economy;

know the basic rules and norms of the scientific organization of labor.

The following **curriculum** is presented:

0 Appendix: Programme Learning Outcomes and Curricula

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



APPROVED
Rector KazNRTU named after K. I. Satpayev
(Beisembetov I.K.)
15.07.2020

MODULAR EDUCATIONAL PROGRAM

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

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

0 Appendix: Programme Learning Outcomes and Curricula


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

Vice-Rector for Research and Academic Affairs

Chairman of APC

Director of the Institute of M&IE

Head of department TM,T&L


D. Nauryzbaeva


K. Tulegenova

K. Yelemessov


K. Yelemessov