ASIIN Seal & European Labels

Accreditation Report

Bachelor's and Master's Degree Programmes
Electrical Engineering
Automation and Control

Provided by
Satpaev Kazakh National Research University, Almaty

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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]
Электроэнергетика	Electrical Engineering, B.Sc.	ASIIN, EUR-ACE® Label		02
Электроэнергетика	Electrical Engineering, M.Sc.	ASIIN, EUR-ACE® Label		02
Автоматизация и управление	Automation and Control, B.Sc.	ASIIN, EUR-ACE® Label		02
Автоматизация и управление	Automation and Control, M.Sc.	ASIIN, EUR-ACE® Label		02
Date of the contract: 26.10.2015 **Submission of the final version of the self-assessment report:** 16.09.2015 **Date of the onsite visit:** 20./21.04.2016 **at:** Almaty				
Peer panel: Bibissara Akenova, student at Karaganda State University, specialty Electrical Engineering; Dr.-Ing. Diedrich Baumgarten; Volkswagen Group; Prof. Dr. sc. techn. Dirk Dahlhaus, Kassel University; Prof. Dr.-Ing. Ralph Kennel, Technical University of Munich; Prof. Dr.-Ing. Christoph Rappl, University of Applied Sciences Deggendorf				
Representative of the ASIIN headquarter: Dr. Siegfried Hermes				
Responsible decision-making committee: Accreditation Commission for Degree Pro-				

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

[2] TC: Technical Committee for the following subject areas: TC 02 – Electrical Engineering/Information Technology)

grammes
Criteria used: European Standards and Guidelines as of 15.05.2016 ASIIN General Criteria, as of 28.03.2014 Subject-Specific Criteria of Technical Committee 02 – Electrical Engineering and Information Technology as of 09.11.2011

In order to facilitate the legibility of this document, only masculine noun forms will be used hereinafter. Any gender-specific terms used in this document apply to both women and men.

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
Ba Electrical Engineering	Бакалавр Bachelor of Engineering	n/a	6	Full time	n/a	4 years / 8 semesters	129 KZ Credits = 213 ECTS	Fall Semester
Ma Electrical Engineering	Магистр Master of Science	n/a	7	Full time	Novosibirsk State Technical University; North China Technical University of Beijing	2 years / 4 semesters	91 KZ Credits = 177 ECTS	Fall Semester
Ba Automation and Control	Бакалавр Bachelor of Science	n/a	6	Full time	n/a	4 years / 8 semesters	240 ECTS	Fall Semester
Ma Automation and Control	Магистр Master of Engineering Science Master of Engineering and Technology	scientific and pedagogical direction profile direction	7	Full time	n/a	2 years / 4 semesters 1,5 years / 3 semesters	170 ECTS	Fall Semester

According to the document "Engineer's Profile" (Annex 1) in the Self assessment report (henceforward SAR), the following **objectives** shall be achieved by the Bachelor's degree programme Electrical Engineering:

- "social-humanitarian and professional training in the field of electric power in accordance with the development of science and technology, and the changing industrial needs, housing, utilities, research centers, graduate schools in staff development.

[3] EQF = The European Qualifications Framework for lifelong learning

- Bachelor electrical power engineers with a holistic understanding of modern electric power industry [and] its problems, who knows the basic laws of physical phenomena and processes in the power industry, with fundamental training in electrical engineering disciplines, the history of their origin and development, who understand current trends in physics, electrical engineering, [and] electric power industry.
- provide knowledge, skills and abilities enabling [...] to analyze problems in the field of professional activity, as well as to put and to find creative ways of their solution, to solve the engineering challenges of designing energy systems and electric equipments in various industries, housing and communal services, to carry out experimental research work with the use of information technology and mathematical modelling."

According to the SAR (Annex 2), the following **objectives** shall be achieved by the Master's degree programme Electrical Engineering:

- "The purpose of the master's program[me] – the training of scientific, scientific-pedagogical personnel of new formation, able to solve problems of improvement of society, economy, production, education, science, to develop breakthrough technologies. [...]
- "[T]raining that meets the needs of the labour market, with relevant professional knowledge and practical skills and [...] ready for theoretical and experimental research in the chosen field of electricity."

Intended objectives in the degree programmes altogether:

- "study of the cycle of General educational disciplines for socio-humanitarian education based on the laws of socio-economic development of society, of history, of modern information technologies, the state language, foreign and Russian languages.
- study of the cycle of basic disciplines to provide knowledge of science, engineering and economic disciplines, as the Foundation of vocational education.
- the study of the cycle majors for the formation of theoretical knowledge and practical skills in designing, selecting, commissioning and operation of electrical equipments and devices, electrical circuits in power systems, various industries, housing and communal services.
- the study subjects forming the knowledge and skills of planning and organizing research, design of electric power systems.
- familiarization with technology and equipment in various industries, housing and public utilities in carrying out various kinds of practices.

- the acquisition of skills in laboratory research, technological calculations, calculation and selection of electrical equipments, starter devices, devices of relay protection and automation and design using modern computer technologies and programs."

According to the relevant website the following **objectives** shall be achieved by the Bachelor's degree programme Automation and Control:

"[H]ighly qualified specialists have advanced knowledge and skills of operation, installation and commissioning of automated process control systems in various branches of industrial production."

"1) Education in the spirit of patriotism, friendship of the peoples of the Republic of Kazakhstan, respect for different cultures, traditions and customs; formation of human, social and personal values of the graduate.

2) Formation of ecological, physical, ethical, legal culture, a culture of thinking; language training bachelor.

3) Formation of the fundamental knowledge and skills needed in the profession."

According to the relevant website the following **objectives** shall be achieved by the Master's degree programme Automation and Control:

"[H]ighly qualified specialists[;] research and teaching in the field of automation and control [...] for organizations of Education and Science, the companies in the development, design and implementation of automated systems."

"1) Mastering advanced knowledge in the field of automation and control.

2) Development of theoretical and practical skills of research in the field of automation and management.

3) Preparation for the research and teaching activities in the institutions of education and science.

4) The accumulation of knowledge through original research."

C Peer Report for the ASIIN Seal[4]

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Various sections of the SAR, in which intended learning outcomes, competence profiles, or job requirements are described; see list for respective learning outcomes for the programmes in the appendix to this report
- Objectives-Modules-Matrices for the degree programmes; available on the Internet for the Bachelor programme Automation and Control here [Download: 21.07.2016] and for the Master programme Automation and Control here [Download: 21.07.2016]; publication of the matrices for the Electrical Engineering programmes in English not verifiable
- Regular feedback loops with cooperating companies in the framework of the Quality Assurance System for the degree programmes under consideration
- Statistical data on employment rates of the graduates of the BaMa programmes Automation and Control (see Table 1.8 in the respective chapter of the SAR)
- Audit discussions

Preliminary assessment and analysis of the peers:

The HEI has defined the objectives as well as the intended learning outcomes of the degree programmes at several occasions in the SAR and other more or less official documents of the respective study programme. Thus, for instance, intended learning outcomes have been described in the SAR itself, but also in the Annex "Engineer's profile"[5], in the Annex „Module Study Plan" (for the Master's degree programme Automation and

[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.

[5] However, it should be noted that only in case of the Electrical Engineering-programmes this could be considered a meaningful source of delivering a competence profile of Bachelor or Master graduates.

Control only) and, eventually, in the Annex "Objectives-Module-Matrix". From the peers' perspective, the question arises immediately, on which of the various descriptions of learning outcomes at programme level they should focus when assessing whether the curriculum could be considered an appropriate match of those goals. It is obvious that the list of learning outcomes in the respective Objectives-Module-Matrix is by far the most precise compilation of competences that graduates are expected to achieve during their studies. Additionally these learning outcomes are largely in line with those given in the SAR or the "Engineer's profile" or the "Module Study Plan", respectively. Nevertheless, different versions of learning objectives at programme level are confusing, even if they could be deemed substantially equivalent – the more so, if they are spread through different communication channels, as it is true in the present case.

What can be seen in the Objectives-Module-Matrices is a very detailed and in-depth description of the intended competence profile of graduates. Thereby, the matrices point to a special focus on Process Automation in different industrial branches (Chemical industry, in particular) regarding the Automation and Control programmes and a prevalence of the Electrical Power Engineering field in case of the Bachelor's and Master's degree programme Electrical Engineering. This observation is noteworthy and we will come back to it in the following chapter (Chap. 1.2). Aiming at the very details of the intended portfolio of skills and competences, the Objective-Module-Matrices at the same time demonstrate convincingly that the major areas of engineering competences (Engineering knowledge, Engineering Analysis, Engineering Design, Engineering Practice, and Transferable Skills) – as outlined in the respective Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology – are, by and large, covered adequately. At times, a better use of the professional taxonomy for the description of learning outcomes could have been made (as to that see for instance phrases like "willingness to [...]" or "readiness to [...]" in the Module-Objective-Matrix of the Master's degree programme Automation and Control). Also, the different cognitive level of the competences as well as the Bachelor's or Master's level might have been indicated more clearly sometimes. All in all, however, the Objective-Module-Matrices could be considered informative and adequate with regard to giving an idea of the competences of graduates in the mentioned degree programmes.

Therefore, although the skills and competences presented in the Objective-Module-Matrices are too lengthy and encompassing to include them, for instance, in the Diploma Supplement as a reference point for external stakeholders, they could serve as a useful starting point for harmonizing and reframing the different versions of the qualifications profile of graduates. Following that, the programme coordinators should draft a lean and consistent qualification profile for each degree programme describing the academic, dis-

cipline-related, and professional qualifications of graduates. This compilation of skills and competencies of graduates should be laid down and communicated in such manner that they are available for both, students and lecturers, who might refer to them in the course of internal quality assurance procedures, for instance.

In this context, the responsiveness to the needs of the relevant industrial branches and companies is considered to be a major strength of the programmes. As peers were told, feedback from cooperation partners in the industry is gathered on a regular basis in the evaluation framework of the HEI's quality assurance system. Reportedly, a survey of cooperating companies conducted on a yearly basis forms an integral part of the quality assurance process with respect to the (further) development of the study programmes. Programme coordinators describe how the feedback from industry is used to accommodate the programme to the demands of the labour market in the respective industrial branches. While the mandatory curriculum is – more or less – unchangeable following ministerial regulations, curriculum innovations and adaptations are continually implemented through the deliberate variation of elective disciplines – as coordinators, lecturers and students concordantly emphasize. In a more institutionalized form the university's employers' council, the so-called Industry Advisory Board, recommends on the intended objectives and derived learning outcomes of the degree programmes, thus ensuring state-of-the-art degree programmes. Along with the monitoring of the students' overall satisfaction regarding the content of the study programmes, teaching and learning conditions, the assessment procedure and the support structure, the input from the industry partner ensures that the interests of relevant stakeholders are taken into account for the quality assurance and further development of the programmes.

Criterion 1.2 Name of the degree programme

Evidence:

- Chapter A of the SAR; underlying precondition of state-regulated programme title (defined in the ministerial order "State Compulsory Education Standards")

Preliminary assessment and analysis of the peers:

The peers found that in the case of the Electrical Engineering degree programmes the English programme name does not accurately reflect either the main learning outcomes or the core content of the programmes. From their point of view, the objectives, learning outcomes and content of these programmes specifically and predominantly focus on the field of *Electrical Power Engineering*. There are very few disciplinary instances aiming beyond that, even in the catalogue of electives courses, which mostly and meaningfully sup-

plement the power engineering core curriculum. Additionally, the historical origin of the programmes which appear to be a merger of four distinctive study programmes also points to this direction. Therefore, *Heat Power Engineering* and *Electrical Power Engineering* are supposed to be the centre of the programmes. In addition to that, students as well as representatives from the industry characterized the programmes as primarily dealing with *Electrical Power Engineering* issues. However, this deficit seems to be restricted to the English translation of the original Kazakh programme name which entails a much more adequate grasp of the core objectives and content. Following that, the peers consider it necessary to adapt the English name of the programmes so that it better suits their *Electrical Power Engineering*-focus and at the same time corresponds to the original Russian title.

Similarly, but to a lesser extent, this question arises with respect to the degree programmes in the area of Automation and Control. The defined learning outcomes as well as the curriculum show a significant orientation towards *Process Automation and Process Control* rather than purely *Automation and Control*. The audit team stresses that Process Control, despite its thematically close proximity with the *Control* issue, does not just span the same array of topics but rather a certain fraction of it. So it can be concluded that the name of the programme is not directly misleading or obviously a misnomer. And this is why the issue might have gone untouched by the peers in the previous accreditation procedure. However, the apparent focus on applications of automation and control issues in industrial *production processes* (as opposed to the product itself) would leave an allusion to that in the name of the programmes reasonable. Consequently, it is suggested to reconsider the name of the programme with respect to its primary focus on process automation and process control.

Criterion 1.3 Curriculum

Evidence:

- Study plans of the degree programmes; accessible for the students through an electronic system covering their individual study plans
- Objectives-Module matrices (Annexes to the SAR); partly accessible on the Internet: Ba Automation and Control (eng).pdf; Ma Automation and Control (eng).pdf (Access 01.08.2016)
- Course descriptions (Module handbooks; incomplete for the degree programmes in Automation and Control as well as for the degree programmes in Electrical Engineering)

- Audit talks

Preliminary assessment and analysis of the peers:
Concerning the curricula, peers were told that one has to distinguish between a national *standard curriculum* for each study programme on the one hand and a so-called *working curriculum* on the other, comprising modifications or variations, the curriculum developers have undertaken in comparison with the standard curriculum. The working curriculum, in turn, is the basis of the individual study plan of a student. The latter one does also include electives the students can choose from as part of their specific study course. It is positively noted that the students' individual study plans are set up and continually available electronically and individually. In the audit discussions students confirm that the system is working quite well.

Although the learning outcomes on programme level – as has been discussed earlier in this report – leave some room for improvement (consistent and concise summaries of the qualifications profile for each programme), the Objectives-module-matrices basically do not only provide a meaningful picture of the competences students are supposed to achieve in the programmes under review but they also plausibly match these qualifications to the respective courses. Therefore, it can be considered proven that the main categories of engineering qualifications – as laid out in the Subject-specific Criteria of the relevant Technical Committee 02 – Electrical Engineering and Information Technology – have been met by the curricula of the study programmes. Following that, there is evidence that each programme consists of courses which could be attributed to the core categories of engineering-specific skills and competences like "Knowledge and Understanding", "Engineering Analysis", Engineering Design", "Engineering Practice and Product Development", "Research and Evaluation" (the latter one for the Master's programme only), and "Transferable Skills". Unfortunately, the HEI did not complete the English translation of the module handbooks in due time, so the peers could not verify in detail whether the learning outcomes at programme level really correlate to those at module level. These gaps have been provisionally compensated by taking into account the module names as well as additional information from programme coordinators and lecturers during the audit visit. Clearly, module/course descriptions (see for this differentiation the following chapter 2.1) need to be completed and updated in the course of this accreditation procedure. In this context and for the accreditation purpose, they must also be translated into English. Eventually, it is necessary that both, students and lecturers, have access to the updated and, where required, supplemented course/module descriptions (see also chapter 5.1).

Nevertheless, the expert panel identifies certain fields of knowledge which are considered as necessary components at least in an advanced stage of the Electrical Engineering education or rather the Automation and Control education and which are barely treated in the programmes under review. Thus, peers concluded from a close inspection of the curricula of the Electrical Engineering programmes that the programme primarily aims at issues related to the field of *Electrical Power Engineering* and should be named accordingly (see chapter 1.2). Regarding that, peers asked where in the curriculum of the Master's degree programme topics like DC distribution in conjunction with power electronics and smart grids are dealt with. Programme coordinators pointed to future developments of the programme through appropriate collaborations, in particular with the University of St. Petersburg. With regard to both the objectives of the HEI in the respective field of research and the intended learning outcomes in the Master's programme Electrical Engineering, peers felt that the students' competences in core areas like Power Electronics, Smart Grids etc. should be enlarged in the curriculum. In a similar vein, the peers come to the conclusion that advanced topics of Control theory are essentially lacking even in the Master's programme Automation and Control. Consequently, from their point of view students' competences in this disciplinary field should be strengthened thus ensuring that the programme-specific competences could be properly achieved.

At the same time, it is known that curricular adaptations like those mentioned above, if they are meant to be mandatory, do need the approval of the ministry. Peers are also aware that, on the other side, the HEIs do have some room for curricular innovation in the area of electives which could be adopted through an internal approval procedure. They certainly do not intend to prescribe the way of implementing curricular changes in order to improve the students' competences in the mentioned fields of the Master's programmes. But irrespective of the concrete manner of curricular adaptations in the Master's programmes, programme coordinators should ensure that, in the end, the respective competences of *all students* have been strengthened, not just of those students with a certain combination of electives.

As in the case of the Electrical Engineering programmes, the discussion with programme coordinators made it very clear that for the Automation and Control programmes too – though to a lesser extent – the name of the programmes does not exactly reflect the curricular content. Apparently, the primary focus of the programmes is process automation and process control, while the automation of manufacturing plants is basically not covered. Following that – as has been said before –, it appears to be commendable to rethink the name of the programme with regard to its primary focus.

The peers received the strong impression during the audit meeting with industry partners that the curricular content has been and for the foreseeable future will be effectively up-

dated in accordance to the needs of the industry. This is obviously achieved by means of adopting the content-related feedback in the form of newly integrated electives. The expert team considers this as a suitable instrument to adequately take note not only of the demands of the related industrial branches but also of current disciplinary approaches in research and development.

It is acknowledgeable that particular attention has been paid to the foreign language skills of Bachelor students in the process of revising the curricula for the reaccreditation procedure. Thus, according to the programme coordinators, general and profession-oriented English skills have been significantly increased. Additionally peers appreciated that, in line with a recommendation of the previous accreditation, the HEI has managed to significantly reduce the proportion of non-technical subjects ("humanities") thus allowing for the implementation of much needed natural sciences disciplines like Chemistry and also for enlarging the share of advanced mathematics courses (modules *Mathematics III*, Mathematical foundations of the theory of systems) and software tools for systems modelling (Matlab).

Criterion 1.4 Admission requirements

Evidence:

- http://talapker.kazntu.kz/en/node/634 (Access 01.08.2016)
- http://talapker.kazntu.kz/en/node/633 (Access 01.08.2016)
- http://talapker.kazntu.kz/en/node/659 (Access 01.08.2016)
- 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
- Audit discussions

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 most of the documents are available only in Russian language, even if presented on the English language websites of the HEI. With respect to the ambition of Satpaev Kazakh National Research Technical University (KazNRTU), the peers strongly encourage making all study relevant information including the admission rules and requirements available in English too. On request, the programme coordinators explained that the selection of the applicants for the Bachelor's programmes is made by the Ministry of Education and Science; more specifically, admis-

sion 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 has been 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 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. Analogous to Bachelor's degree programmes, educational grants for Master's 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. On request, programme coordinators clarify that Bachelor graduates would have to pass both exams, irrespective of their final grade in the completed Bachelor's programme. Though their accomplishments in their Bachelor's study would be taken note of, the applicant will nevertheless be urged to pass the said admission exams. Though wondering why Bachelor graduates, who have proved that they do have the relevant disciplinary knowledge on Bachelor's level, are forced to undergo an exam aiming at this very disciplinary knowledge, the peers, by and large, consider this an appropriate approach to secure the quality of the academic standard.

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

In certain instances the requirements of the criterion are considered *not fulfilled*. This assumption takes into account the statement of those responsible for the programmes as well as the documents submitted along with the statement.

Qualification profile (1.1., 1.3)

In its statement the university has largely reiterated the generic objectives of the study programmes and otherwise refers to the programme learning outcomes which have been detailed in different versions in the SAR, the documents "Engineer' profile" and "Module Study Plan" as well as - most differentiated - in the respective Objectives-Module-Matrix. But the peers still feel that the programme coordinators should draft a lean competence profile for each degree programme focusing on the academic, discipline-related, and professional qualifications of graduates. For that purpose, the most detailed version of programme learning outcomes in the respective Objectives-Module matrix might be helpful and should be referred to. These qualification profiles should be consistently communicated in all documents which relate to the intended learning outcomes in the study programmes. The qualification profile should also be integrated into the Diploma Supplement of each study programme which still has to be produced by the university. Peers confirm a requirement to that end (see below, chapter F, requirement 1). In this respect, they also underline that as a member of the Bologna process Kazakhstan has committed itself to adopt the instruments designed to establish the European Higher Education Area. One of these instruments is the Diploma Supplement.[6]

Name of Degree programmes (1.2, 1.3)

Concerning the name of degree programmes in Electrical Engineering, the peers concede that the reference to Heat Power Engineering as an integral part of the programmes might have been misleading. Nevertheless, they confirm their critical view on the English name of the programmes "Electrical Engineering" because in their perspective the main focus of the programmes is Electrical Power Engineering as is clearly indicated in the original Russian name. The expert panel understands that the name of the programme has been chosen according to an official state-regulated classification in line with the "International Standard Classification of Education".[7] However, the "International Standard Classification of Education" does by no means rule out that study programmes focusing on the generation, transmission, distribution and consumption of electrical energy are classified under the term Electrical Power Engineering. According to criterion 1.2, curriculum developers should provide evidence that the name of a study programme is aligned with its main content. In case of the Electrical Engineering programmes, the Russian name fits perfectly well with this requirement while the English translation is considered neither correct nor adequate in terms of content. The auditors therefore confirm a requirement to correct this (see below, chapter F, requirement 4).

[6] See for further information and samples of the Diploma Supplement: http://ec.europa.eu/education/resources/diploma-supplement_en (Access: 16.09.2016)

[7] Third revision 2013, see http://www.uis.unesco.org/Education/Documents/isced-f-detailed-field-descriptions-en.pdf (Access: 16.09.2016)

With regard to the name of the degree programmes Automation and Control, there is no reason to alter or skip the recommendation the expert team has agreed upon previously due to arguments discussed above. The programme coordinators should consider adapting the name of the programmes more closely to their core areas process automation and process control (see below, chapter F, recommendation 4).

Curriculum (1.3)

Pursuant to the statement of the university, new curricula have been provided which are said to embrace the critical comments of the peers concerning the content of the programmes. Apart from the fact, that only in case of the Master Electrical Engineering modifications are indicated in a discernible manner[8] while curricular adaptations in the Master Automation and Control seem to be limited to the *Adaptive control systems*-electives, the auditors were basically unable to assess these modifications due to the fact that module descriptions for them simply have not been made available (as to that see also the final assessment of criterion 5.1). Generally, the experts acknowledge that the curriculum developers on the HEI's side apparently do seriously take into account their indications and critical remarks. But because a direct influence on the curriculum could only be exerted by way of skipping or introducing new electives, the peers underline that any such modifications in the area of the electives do not necessarily have an impact on the qualifications of all students. With regard to prospected changes in the area of electives, the HEI will have to be mindful of this in order to ensure that all students of a study programme shall achieve a broader competence in the sought field of expertise. Following that, the auditors remain with the curriculum-related requirements in the preliminary draft of their recommended resolution (see below, chapter F, requirements 7 and 8).

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Study plans of the degree programmes; partly accessible in English on the internet: individual study plans accessible for the students through an electronic system covering their individual study plans
- Module/Course descriptions (incomplete in the English version)

[8] Modules/courses *Modeling of elements of electric power systems*, *Power Electronics* and *Converter technics* according to Annex 6.

- Regulation on the system of credit transfer for the type of ECTS in Kazakh National Research Technical University named after K.I.Satpayev R 029-04.12.-1.01 – 2015
- SAR and audit discussions

Preliminary assessment and analysis of the peers:
The degree programmes are divided into modules which principally form consistent and coherent teaching and learning units. For the most part, modules ("disciplines" or "courses") are plausibly composed of theoretical, practical and laboratory units. Thereby, the size of the modules ranges, regularly, between 3 and 8 ECTS credit points (see chapter 2.2). The sequence of the modules, the inner logic of their composition, appears to be reasonable in all degree programmes under consideration; in fact, this has been convincingly demonstrated for the Bachelor's programme Automation and Control in a module sheet indicating the substantial interrelationship of courses.

It is confusing that the HEI – at least in the SAR and the Annexes which have been prepared in English – uses different terms to designate the same matter, i.e. the module as the unit of reference. The terms "discipline", "course" and "module" are, for that matter, often used synonymous, without visible differentiation. Otherwise, in the study plans of the Bachelor's and Master's programmes Automation and Control an array of thematically interlinked courses/modules is summarized as a "module" too, obviously not using the term in its proper technical sense. Since it is impossible to check the original Russian wording in all study-related documents, peers generally suggest verifying thoroughly that a consistent and unambiguous use of the concept of module, in particular, is made throughout the documents.

Practical components (practice, laboratory units, internship) which aim at deepening and applying the theoretical knowledge gained during the study course are implemented in the Bachelor's as well as in the Master's programmes. Particularly in the Bachelor's programmes the industrial practice plays an important role. It can be observed that the HEI puts great emphasis on a profession-oriented education and preparation of the students, thereby consequently making use of its close ties to the regional industry of the related branches. Counselling and supervision of the industrial practice and of the students' obligation to submit and present a report about their internship clearly illustrate that the HEI takes full responsibility for the quality of these practical study phases. In this context, the combination of "undergraduate practice" and the degree project (Bachelor thesis), both of which have to be thematically connected, is considered a meaningful contribution to the achievement of the learning objectives.

In a certain sense the profession-oriented approach of the curricula is also maintained by the feedback from the industry which is strongly reflected in the proposition of electives and also in the recruitment of external experts from the cooperating companies as lecturers for the degree programmes.

There are no statistical data about the mobility of students in the programmes under review. For the Automation and Control programmes and the Electrical Engineering programmes a few outstanding cooperative relationships with international universities are mentioned which have been participating in an exchange of graduate and doctoral students. Mobility of students at undergraduate level, however, seems to be rather low, if measurable at all. Partly this may be due to the fact that the English language skills of students have been found improvable, at least, although – as already mentioned – the share of foreign language courses has been enlarged meanwhile in the Bachelor's programme Automation and Control. But on the other hand, the teaching staff's command of English also seems to be limited, as far as the peers could judge from their experience in the audit talks. Therefore, it might be constructive taking appropriate measures to improve the English language skills of both, teaching staff and the students (for instance by enlarging the amount of courses held in English, intensified international cooperation etc.).

Noticeable in this regard is the double degree option of the Master's degree programme Electrical Engineering established in cooperation with Novosibirsk State Technical University and North China Technical University of Beijing. But, here again, no statistical information is available on how many students do make use of this opportunity. Principally, this Double degree option is taken note of, but not assessed as an individual type of the respective degree programme, because neither does the SAR deliver detailed information about the programme variation nor have representatives of the partner universities been participating in the onsite visit. Yet, according to the procedural guidelines for accrediting joint programmes, this is an indispensable procedural requirement.

Reportedly, the recognition of learning achievements at other universities as a necessary precondition for the mobility of students is successfully implemented by means of learning agreements between the student and his department advisor. The procedure is regulated bindingly and seems to be consequently followed in practice – as the students confirmed on request.

Criterion 2.2 Work load and credits

Evidence:

- Study plans of the degree programmes; partly accessible in English on the internet: individual study plans accessible for the students through an electronic system covering their individual study plans
- Module/Course descriptions (incomplete)
- SAR and audit discussions

Preliminary assessment and analysis of the peers:

The HEI has established the national Kazakhstan credit point system which is workload-oriented and based on the differentiation between lecture hours, student self-study time and office hours (meaning a kind of accompanied learning, *in office*). According to that, one Kazakh credit point equals 45 hours of student workload (15/15/15). The distribution of Kazakh credit points for the degree programmes has been converted into the ECTS credit point system. For the most part of the regular curriculum of the Bachelor's and the Master's programmes alike, the conversion factor ranges between 1.5 and 1.8, due to the significantly higher weight of certain modules, like "Internship", "Pregraduation practice" or "Graduation work" in the Bachelor's degree programmes or "Scientific research work", "Research Practice" and "Registration and protection of the Master's thesis" in the Master's degree programmes. Principally, this calculation of student workload could be deemed reasonable because it takes note of the fact that workload expectations for the modules mentioned might differ from the average calculation basis. However, it must be stated that not only the total numbers of ECTS credit points allocated to the individual degree programme are partly inconsistent, in particular with respect to the Electrical Engineering programmes, but also that the workload calculation in the module descriptions – if there is any at all – displays inconsistencies (Automation and Control programmes) or is wholly intransparent, as again particularly in the case of the Electrical Engineering programmes. These inconsistencies need to be removed in the course of the re-accreditation procedure. At least the information in the original Russian or Kazakh documents must be consistent, clearly arranged and easily understandable. In order to assure the usability of module descriptions for students, they should be arranged along the same lines ideally.

Neither from the SAR nor from the study plans provided were the peers able to easily identify the average workload of the students per semester. The programme coordinators are requested to submit an exemplary study plan for each degree programme containing information about the sequence of courses students have to pass per semester and the

workload in terms of Kazakh and ECTS credit points associated with that (in case of the Master's degree programme Automation and Control for both directions).

From the description of the quality assurance system put in place for the degree programmes it can be inferred that the responsible bodies do, inter alia, evaluate the factual workload of students for the individual modules periodically. Principally, this is a suitable methodical instrument to either adapt the credit point allocation or the content of modules in case of significant deviations of the evaluation results. Since, in fact, only a half sentence in the SAR for the Automation and Control programmes leads to this conclusion, the peers explicitly encourage monitoring the actual student workload for the purpose mentioned above.

Criterion 2.3 Teaching methodology

Evidence:

- Study plans of the degree programmes; partly accessible in English on the internet: individual study plans accessible for the students through an electronic system covering their individual study plans
- Module/Course descriptions (incomplete in the English version)
- Relevant chapters of both SAR
- Audit discussions

Preliminary assessment and analysis of the peers:

Study plans and module descriptions illustrate that the curriculum consists of lectures, laboratory and practical units as regular didactical instruments. In particular, the combination of theoretical and practical teaching and learning units is welcomed, since it effectively contributes to a full and applicable understanding of the theoretical knowledge delivered in the lectures. Moreover, the different forms of profession-related practical units ("Internship", "Practice", labs) which are more or less strongly oriented to real-world engineering practice appear to be successfully embedded into the didactical concept of the staff. The peers derived that conclusion from the extraordinarily positive judgment about the competences of the teaching staff and the qualifications of the graduates which representatives of the industry expressed in the audit talks.

During the onsite inspection of the laboratories of the responsible departments the audit team received the impression that teaching labs have been successfully built up and, at the same time, are meaningfully integrated into the teaching process.

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. Perhaps not surprisingly then, as has been stated previously, it could be observed that the competence to speak English was very diverse among the students and the teaching staff alike. The peers therefore consider it worthwhile encouraging staff members to offer English modules in order to enhance their own language competences, and also asking the students to make English presentations, submit English reports or use English documents. This would foster the oral and written language competences and thus provide incentives for an intensified international mobility of both students and teaching staff.

Criterion 2.4 Support and assistance

Evidence:

- Relevant chapters of both SAR
- Document "Manual for students studying at KazNRTU" (Annex to the SAR)
- Document "Guidance on the preparation of individual curriculum" (Annex to the SAR)
- Student's Guidelines (Annex to the SAR)
- Audit discussions

Preliminary assessment and analysis of the peers:

It is highly appreciable that students are looked after and advised by an individually assigned academic advisor throughout the student life cycle. Apparently, these advisors are lecturers or professors of the Faculty. The academic advisor particularly helps and supervises students in developing their individual student plan, but also supports students regarding personal matters. The students confirmed the supportive role of the mentoring service of the academic advisors.

It also makes good sense that, when starting the study programme, first-year students receive Student's Guidelines besides other preliminary information sources containing all relevant information about the educational process of the credit system, structural units of the university, general requirements, the students' rights and obligations, and main provisions of monitoring and evaluation of students' knowledge. The HEI's website also provides a number of additional counselling and advisory services that can be used by the students.

In sum, 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 requirements of the above-mentioned criteria are considered to be *largely met*.

Language Skills (2.1)

The peers appreciate that the university has taken measures already to foster the international mobility of the students and the teaching staff alike. In this respect they also highly value the many examples of successful international mobility of students and members of the teaching staff. However, as the list provided for the Automation and Control programmes clearly shows, most students studying abroad - and particularly in Western countries - were graduate students, i.e. Master and PhD-students. As to the Electrical Engineering programmes, it is openly conceded in the university's statement that mobility of Bachelor students virtually does not exist to date due to the level of the students' English skills. All efforts to better this situation are well received. In this vein the peers propose to support these efforts with a recommendation addressing the issue (see below, chapter F, recommendation 1).

Student workload (2.2)

Along with its statement, the university, inter alia, provided updated curricula which also give an insight into the student workload per semester. Although more clearly for the Bachelor programmes, the average workload in the Master programmes could be perceived as well. The peers concluded that the students' workload per semester all in all appears to be acceptable and bearable. This conclusion takes also note of the fact that the students voiced no complaints to the contrary during the audit discussion with them. Nevertheless, the peers consider it recommendable that the responsible faculties/departments monitor the actual student work load so as to keep it in line with the credit point allocation (see below, chapter F, recommendation 2).

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Relevant chapters of both SAR
- Module/Course descriptions (incomplete in the English version)
- Document “Assessment of Knowledge DP 706 KNTRTU” (Annex to the SAR)
- Document “Elimination of Debt DP 707 KNRTU” (Annex to the SAR)
- Document “Testing DP 717 KazNRTU” (Annex to the SAR)
- Document “Position on the procedure for conducting oral examinations P 029-04.27-01.1.30.02-2015” (Annex to the SAR)
- Document “Position on the procedure for conducting written examinations P 029-04.27-01.1.30.01-2015” (Annex to the SAR)
- Onsite-inspection of a sample of exams and graduation works
- Audit discussions

Preliminary assessment and analysis of the peers:

The peers took note that the examination procedure at the HEI encompasses different stages. Current, intermediate, midterm, final assessments combine to a continuous monitoring of the students’ learning progress. Although this concept results in an increasing number of examinations – when considering all kinds of assessments and not just the examinations to be passed in the scheduled examination period following the regular semester term –, it also allows for a more precise judgement about the learning achievements of the individual students. With this information at hand, it is possible to more effectively advice students and to help them plan further steps in successfully proceeding with their studies. Accordingly, it is consistent that the university collects information about the students’ academic progress at each stage of the study course, their current level of knowledge, the rating score of students’ performance, and the tendency of their academic progress. This system enables the university to identify students falling behind immediately and take necessary action, if necessary.

Additionally, this concept consequently increases the likelihood of a greater variety of examinations in an individual module, thus at the same time serving its claim of assessing the extent to which the defined learning outcomes have been acquired, actually. From the peers’ perspective, this observation at least partly explains why students have not been complaining about the examination burden. They reported about six to seven final examinations on average per semester, which does not show the whole picture, as mentioned before. Although the audit team principally approves the examination concept of the HEI (for didactical reasons), it is impossible to retrieve an inclusive information about

the average examination load per semester from the study plans or the module/course descriptions. In order to get a full picture of this, the programme coordinators are asked to give an exemplary overview of the examinations per semester for all degree programmes under review. This might be best done graphically along with the requested sample study plans indicating the courses ("disciplines") and the student workload in terms of credit points per semester (see chapter 2.2). Especially the information about module-/course-related assessments appears to be either incomplete (Automation and Control programmes) or wholly missing (Electrical Engineering programmes). This is also true with regard to the composition of the final grade which is not clearly explained in the course descriptions, if referred to at all. As the course descriptions shall provide the students with comprehensive information on the modalities and requirements of the modules/courses, this would be an indispensible point of a revision of the module descriptions (as to this see in more detail chapter 5.1).

Concerning the sample of exams and graduation works for the Bachelor's and the Master's programmes which the peers inspected during the onsite visit, they came to the conclusion that these principally confirm the achievement of the intended learning outcomes at the desired academic level. It is also welcomed in this respect that students of the Bachelor's as well as those of the Master's programmes are offered special preparation courses for conducting and writing scientific works. Since most of the graduate works or Bachelor's and Master's theses are application-oriented and conducted externally in cooperating companies, the HEI has already taken measures to ensure the scientific quality of the theses and retain full responsibility for the quality in terms of topics, means of conduct, and supervision. However, particularly with regard to the Master theses, the peers consider a more institutionalized form of the coordinated supervision by the university and the companies worthwhile in order to sustainably assure the quality of the results. It is suggested to take note of this for the further development of the Master's programmes.

The organisation of exams, re-sits, application and deregistration of exams appears to be working well.

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

The peers consider the requirements of this criterion as *largely fulfilled*.

Although the study plans being submitted along with the statement of the university do contain a column referring to examinations, the information given there is not suited to

clarify the number of examinations per semester - as requested in the preliminary assessment of the peers. As peers have learnt, there are forms of continued assessment during the semester besides midterm and final examinations. And this manifold assessment system is reflected neither in the updated curricula nor in the lengthy explanations concerning examinations in the HEI's statement. However, as peers have already indicated that they principally acknowledge a closer monitoring of the students' learning achievements, and also understand this system as a university-wide institution, they do not see any need for further action in this regard.

However, as has been argued above, with respect to the Master programmes the expert panel recommends institutionalizing the coordination of the thesis supervision between the university and the companies (see below, chapter F, recommendation 5).

4. Resources

Criterion 4.1 Staff

Evidence:

- Respective chapters of the SAR
- Staff handbooks (incomplete for BaMa Automation and Control)
- List "Research Papers" (Annex 11 to the SAR for the Electrical Engineering Programmes)
- Audit discussions

Preliminary assessment and analysis of the peers:

Staff resources of the responsible departments for the degree programmes under review are apparently sufficient, though markedly limited. On a first glance, the situation in the Automation and Control programmes (only 1 full professorship) seems even worse as compared with the Electrical Engineering programmes (5 full professors). This would have meant a fundamental and extremely problematic reduction of staff resources for the programmes even compared with the previous accreditation which, nota bene, has been covering the Bachelor's programme only. But apparently, this first impression has been misleading because the lecturers with a "candidate"-status are – as programme coordinators pointed out – recognized as professors underlying the respective disciplinary and didactical competence requirements for their appointment. However, the staff handbook with information about the teaching staff available for the programmes is remarkably incomplete in case of the Automation and Control programmes, with only two lecturers

actually listed. In order to get a more reliable information basis about the personnel teaching in these programmes, the responsible department is requested to supplement the staff handbook accordingly and submit the updated version along with the statement to this audit report.

On the other hand, the peers recognized that during the previous accreditation period the HEI has managed to a considerable extent to regenerate the teaching staff. This is considered as a promising basis for the further development of the teaching quality and, closely related to that, the research capacity of the departments.

Given the demanding research objectives of the HEI, the peers receive the impression that research funding is playing an increasingly important role with regard to the overall budget of the HEI and the upgrading of its research equipment. Reportedly, Bachelor as well as particularly Master and PhD students are actively involved in the research projects. However, when looking at the reported research projects and published papers (mainly documented for the Electrical Engineering programmes), peers came to the conclusion that, in spite of the visible and commendable efforts, the teaching process and its application-orientation as yet significantly outweigh the research activities. These, in turn, from the peers' perspective are of decisive importance for the quality, up-to-dateness, and sustainability of particularly the Master's programmes. According to indications of members of the staff, time limitations are a crucial factor for restrained research efforts, even though the teaching load could theoretically be reduced if the teaching was secured otherwise. To sum up, the audit team gained the impression that the environment for research activities is not or to an only limited extent conducive. That might have a negative impact not only on the HEIs long-term research objectives, but also and more immediate on the quality development of the Master's programmes. That is why it is considered indispensable that the HEI provides a concept for the further development of the teaching staff towards an international research profile. Evidence for initial steps to the implementation of this concept should be provided.

Criterion 4.2 Staff development

Evidence:

- Relevant chapters of both SAR
- Table "Personnel Development" (Annex 13 to the SAR for the Electrical Engineering Programmes)
- Audit discussions

Preliminary assessment and analysis of the peers:
In both self assessment reports the HEI 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. However, when talking to the staff members many of them refused to speak English as they felt that their level of English was not adequate to converse in a proper way. It should be stressed here again that learning a language can best be achieved through practical application. It therefore seems commendable that the HEI should take appropriate measures to improve the language skills of staff members and that these, in turn, should offer parts of their lectures in English.

Criterion 4.3 Funds and equipment

Evidence:

- Relevant chapters of both SAR
- „Lab list“ (for the BaMa Electrical Engineering; Annex 14 to the SAR)
- Onsite-inspection of institutions and laboratories
- Audit discussions

Preliminary assessment and analysis of the peers:
During the discussion with representatives of the management of HEI 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 it is plausible that the governmental funding is closely linked to the number of students permitted to the university and the funding thus being secured for the next years, the peers wondered whether 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 HEI were highly dedicated to support the university. Long term agreements of three to five years between the university and its partner companies on the one hand and the university’s contribution to the technological development of the companies (by conducting research projects) on the other provide evidence for that. Finally, the expert panel concluded that the core business in all likelihood is secured for the upcoming accreditation period.

The actual state of the laboratories, which peers are able to inspect during their onsite-visit, largely confirmed the impression of the limited research capabilities of the departments and, along with that, the laboratorial equipment for the Master's programmes and Master theses. Peers concluded that the laboratories do certainly satisfy the needs for the Bachelor's programmes, but do not yet meet the requirements for sophisticated research projects which are normally expected in the frame of Master's programmes and particularly Master theses. Aligning improved conditions for research activities for a young, competent teaching staff with an enlarged, research-capable physical infrastructure would strongly contribute to the maintenance and further development of the quality of the degree programmes, particularly the Master's programmes. And the long-term engagement of the industry with the university that is said to aim primarily at the acquisition of modern laboratorial equipment may contribute as a driver of this development. Having said that, the peers deem it necessary and feasible at the same time establishing research labs so as to foster research work and, thus, to facilitate adequate research competences of the students. As evidence the HEI should prepare a schedule for that build-up and provide evidence that initial steps to its implementation have been taken.

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

The requirements concerning staff resources, funds and equipment are *not fully met*.

Qualification of teaching staff (4.1)

Regrettably, the responsible department for the Bachelor's and Master's programmes Automation and Control did not provide a completed Staff handbook so as to enable the expert panel to get a more accurate picture of the disciplinary expertise of each member of the teaching staff. All the more so since this information apparently is already available for students on the websites of the department, though in Russian language only. On the other hand, the auditors have received a positive impression of the competence of the teaching staff, principally. Therefore, they decide to do without this supplementary information, thus assuming that the disciplinary expertise of the staff for the Automation and Control programmes is adequate for conducting the programmes. From the statement of the HEI, the peers at the same time concluded that the number of academically qualified staff for these degree programmes can be considered adequate as well.

The expert panel is thankful for the list for research projects and publications scheduled or carried out for the most part in the last two years (Statement, p. 14ff.). In principal, they consider these research activities as highly valuable steps in the direction of the research orientation the university now bears in its name, especially when seen against the

background of the high teaching load of the academic staff. But in the light of the impression the experts received during the onsite inspection of papers and laboratories, this cannot qualify as verification of a systematic research profile which would fit the research-oriented objectives defined for the study programmes under review, particularly the Master programmes. Consequently, the peers propose a requirement urging for a more comprehensive and strategic approach to develop a sustainable research capacity, and initial steps towards its implementation (see below, chapter F, requirement 5).

Laboratory equipment (4.3)

What has been derived from the HEI's statement with regard to staff development seems to apply with respect to the laboratory equipment as well. Especially for the Master programmes a build-up of research labs is indispensible - as peers have argued above -, if students should be successfully enabled to achieve the intended research competences. From the peers' perspective, the more detailed lab development plan of the Automation and Control department does not satisfy the needs of a systematic and research-oriented build-up some worthwhile improvements notwithstanding. To sum up, here too the peers propose to file a requirement requesting the HEI to take a more comprehensive stance in developing its laboratory equipment with a view to its research objectives (see below, chapter F, requirement 6).

With regard to both, research competences of the teaching staff and research capacity of the departments involved, the peers consider it reasonable to more closely check the development of the Master programmes through external quality assurance and thus propose a shortened accreditation period for these programmes.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module/Course descriptions (incomplete in the English version)
- Audit discussions

Preliminary assessment and analysis of the peers:

Module/Course descriptions have been already mentioned at several times in this report. First of all it should be stated that the Module handbooks submitted along with both SAR are incomplete to a different extent for all degree programmes – at least as far as the

respective English version is concerned. This situation has complicated the assessment of the consistency of the curricula regarding the sequence of the modules and their correspondence with the learning objectives at programme level. As expected the module descriptions of the Automation and Control programmes appear to be more mature in summarizing and presenting the most important study-related information. But there too, large parts are missing or not translated (module learning outcomes in case the Bachelor's programme for instance). Unfortunately, the course descriptions of the Electrical Engineering programmes – as far as available – are even less comprehensible and transparent. Thus, as far as the relevant information is concerned, the course descriptions of all programmes bear certain deficits and shortcomings apart from missing descriptions – though related to different issues in the Automation and Control degree programmes and in the Electrical Engineering programmes respectively.

Regarding the description of learning outcomes for the individual modules, a different approach for the Automation and Control programmes and the Electrical Engineering programmes can be observed in what has been produced or translated so far. In the descriptions for the Bachelor's degree programme Electrical Engineering (as far as available in an English translation), generally a series of very generic learning outcomes is defined and attributed to the individual modules, thereby indicating the difference between the module learning outcomes through individual combinations of those generic ones. This way, neither a comprehensible information about the knowledge and competences students are supposed to acquire in the respective module is provided nor is it plausibly demonstrated how the learning achievements in the individual modules contribute to the overall qualifications aimed at in the programme. Learning outcomes for the courses/modules of the Master's programme Electrical Engineering are almost inexistent. Contrary to that some of the learning outcomes defined for the Bachelor's programme Automation and Control – as far as they are available in translation – could be considered appropriate with regard to the Bachelor level of education and the distinction of different forms of competences (see, for instance, the modules *Optimization methods – OM* (MO3307), *Nonlinear automation control systems* (NSAR3302), *Linear automation control systems* (LSAR3301)). Looking at the module descriptions of the Master's degree programme Automation and Control, these are incomplete as well; moreover some of them are misplaced (see module *Linear Automation Control Systems* (LSAR3301) which obviously belongs to the Bachelor's programme).

Taken together, the peers consider the module descriptions (or to put it more correctly: the English version of the module descriptions) far too heterogenous and incomplete to assess whether they suit the requirements or in what instances they need to be improved. Therefore, the peers ask the programme coordinators for submission of a com-

plete and, where necessary, translated and supplemented set of module descriptions for each programme on short-term. They should be easily manageable and identifiable (for instance by using bookmarks) and consistently prepared. Additionally, it should be indicated in the statement whether the module descriptions as a valuable means of information for the students are already accessible for them, possibly with evidence for that (internet link or something else).

Peers will then make their final assessment of the module descriptions on this revised factual basis.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Samples of Diploma and Transcript

Preliminary assessment and analysis of the peers:
Both SAR state that besides the ordinary Diploma the graduates also receive a Diploma Supplement on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about the individual performance. Additionally the Diploma Supplement should explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems and thus to serve the international recognition of the academic achievements and the mobility of the graduate. Programme coordinators confirmed during the audit discussions that this kind of Diploma Supplement does already exist for each degree programme. The peers ask for their short-term submission together with the statement of the HEI.

Criterion 5.3 Relevant rules

Evidence:

- Relevant chapters of both SAR
- Relevant documents and regulations available in English language, see http://kazntu.kz/en/node/6999 (Access 2016-08-04)

Preliminary assessment and analysis of the peers:
All rules and regulations concerning the status of the university, its organs and institutions, the professors, lecturers and students do either originate in nationwide laws of the Ministry or are self-imposed by the university. As peers could assure themselves, the relevant regulations and rules are publicly available for all stakeholders; regarding the study process, the most important of them are also available in English.

The peers consider this suitable and sufficient with respect to transparency requirements.

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

The requirements concerning the transparency of the degree programmes under consideration are *not fully met* in certain instances.

Module descriptions (5.1)

By the time of the audit visit, the module descriptions for all degree programmes have been incomplete, as far as the English version is concerned. In their preliminary assessment, the peers therefore requested the HEI to provide complete module handbooks in a translated version. Unfortunately, this request has been omitted by the HEI. However, from the information the peers received about the programmes from the SAR, the curricula, the HEI's statement and supplementary documents, and, not least, the module descriptions available so far, they come to the conclusion that this deficit could be adequately addressed by a slightly modified requirement (as compared to its original version; see below, chapter F, requirement 2).

Diploma Supplement (5.2)

As far as can be judged from the HEI's remarks in the statement and the additional documents presented besides the statement, a programme-related Diploma Supplement of the kind normally used in the European Higher Education Area is not issued to graduates on a regular basis. Thus the HEI should be request to produce and issue it in the course of the accreditation procedure (see below, chapter F, requirement 3). Regarding this, the university may refer, for instance, to the already existing sample of a Diploma Supplement on the website of the European Commission (see also above, final assessment of criterion 1).

Otherwise, the already issued "Addendum to Diploma (Transcript)" provides detailed information about the individual study achievements so that external parties are able to

understand and compare the composition of the final grade. As to that, no further action is needed.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Relevant chapters of both SAR
- Aggregated statistics on student evaluation of modules ("disciplines") and results of examinations in the study year 2014 – 2015
- Information given on the English website: http://kazntu.kz/en/about-university/smk (Access 04.08.2016)

Preliminary assessment and analysis of the peers:

It can be inferred from the SAR and explanations of respresentatives of the HEI that a quality management system has already been established at the university. The ISO 9001 – 2001 certification has demonstrably proven that the HEI has established institutions and implemented appropriate procedures to ultimately "develop a culture of quality and continuous improvement of educational programs" as the university puts it (SAR Automation and Control, p. 57). The ambitious combination of internal and external quality assurance procedures (like ISO Certification, international Programme and Institutional Accreditation, participation in international Ranking projects) also convincingly demonstrate the HEIs willingness to plan, act and develop according to international agreed quality standards.

At the centre of the internal quality assurance system of teaching and learning as well as its supportive personal and material infrastructure the university has placed a set of evaluation and surveying tools covering the whole student life cycle. This includes evaluation surveys which systematically aim at the feedback of all relevant stakeholders (employers, students, teaching staff, and graduates) to the quality of the teaching and learning processes as well as its material and financial base. In case of the close contacts of the university and its departments/institutes to the local industry, a structured feedback loop – in the form of comments about necessary competences of graduates and, for this purpose, suggested electives – has been evidently brought to light in the audit talks.

But with respect to all the other quality dimensions of the teaching and learning process – curriculum, workload, counselling and advice, examinations, to name but a few – it is from the information and data available much less clear how and to what end they have been effectively used for the improvement and further development of the programmes. This is especially true for the Bachelor's degree programme Automation and Control which is the only one amongst the programmes under review that has undergone an international accreditation five years ago. In certainly would have been of special interest for the audit panel to see whether and how the quality management of the degree programmes has proven its worth over the years. When, for example, students confirmed that feedback processes in the course evaluation are working well, this would have been even more persuasive in terms of internal quality assurance if developments of the curriculum or study-related arrangements could have been plausibly traced back to this feedback loop. And the same applies to the mass of information and data the university must have had gathered in the programmes over the years. It can be concluded from the SAR – and implicitly from the reported ISO certification – that the HEI with its quality management system has also established a reporting and documentation system storing all relevant statistics, key figures and qualitative data. Yet, very little of that can be verified from the available information about the degree programmes. And even the small proportion of statistical results of the student's course evaluation and examination statistics bears exactly this weakness: In both cases it is given without any comment and, thus, does not provide any clue to what extent the departments have made use of the results for the quality development of the programmes. Consequently, the peers recommend to further developing the reporting and documentation system in order to make better and more transparent use of the data gathered in the framework of the quality management system in place.

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

The requirements concerning the quality assurance system are *generally covered*.

Students workload (2.2, 6)

See above, final assessment of criterion 2, and below, chapter F, recommendation 2).

Quality assurance system (6)

For reasons discussed in detail in their preliminary assessment, the peers suggest a recommendation concerning the further development of the quality assurance system. In

particular, the reporting and documentation system should be improved so as to make better and more transparent use of data and information gathered by means of surveys and evaluation instruments (see below, chapter F, recommendation 3).

D Additional Documents

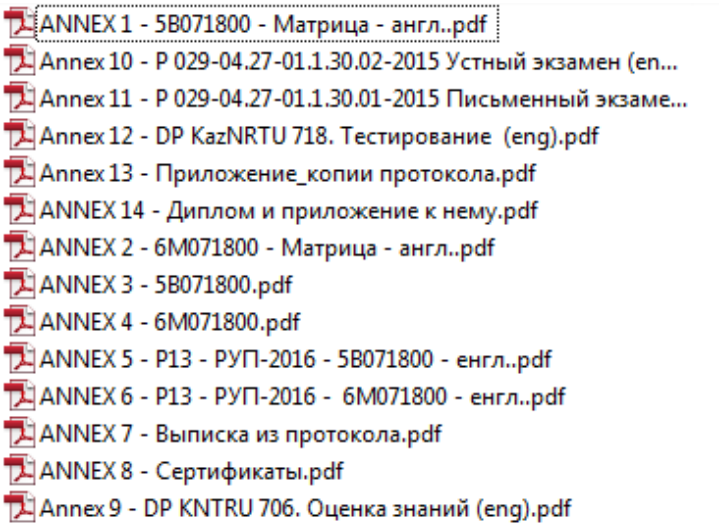
Before preparing their final assessment, the panel ask that the following missing or unclear information be provided together with the comment of the Higher Education Institution on the previous chapters of this report:

1. All programmes: Completion of module handbooks and supplement of missing module descriptions, respectively [ASIIN 5.1]
2. All programmes: Submission of sample study plans and schematics, indicating the modules, examinations, and student workload in terms of credit points (Kazakh and ECTS) per semester [ASIIN 2.2, 3]
3. All programmes: Submission of a programme-specific Diploma Supplement [ASIIN 5.2]
4. BaMa Automation and Control: Completion of the Staff handbook [ASIIN 4.1]

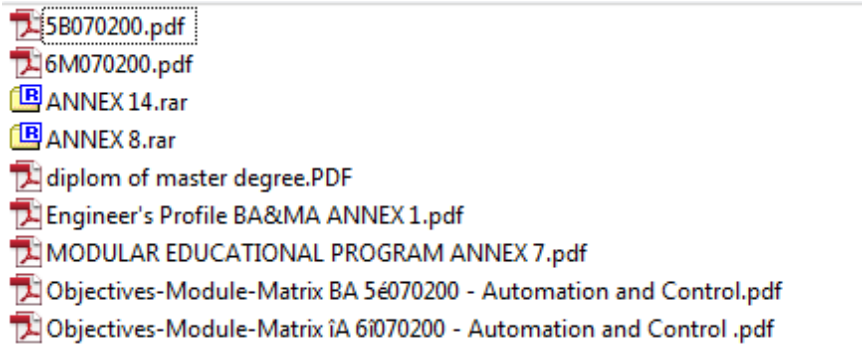
E Comment of the Higher Education Institution (10.09.2016)

The institution provided an extensive statement as well as the following additional documents:

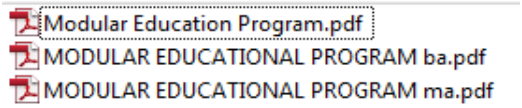
For the Bachelor's and Master's Degree Programmes Electrical Engineering



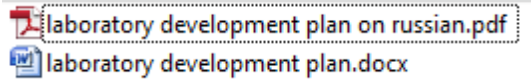
For the Bachelor's and Master's Degree Programmes Automation and Control



With Annex 8 containing:



With Annex 14 containing:



F Summary: Peer recommendations (26.09.2016)

The university has provided a very lengthy statement along with many internet links, leading to documents either in Russian or English language, and two extensive folders of documents. The sheer amount of additional material has made it difficult for the expert team to distinguish explanatory information or additional material from pure repetition in the short time period available for its final assessment. That would have been far easier if the HEI had generally restrained its statement to precise explanations, where necessary, and additional material only as far as explicitly requested by the peers (see chapter D). As to this however, important information concerning, for instance, the module descriptions for all degree programmes or the Staff handbook for the degree programmes Automation and Control is still missing although being asked for by the expert team. Insofar as it is considered meaningful, the peers refer to the university's statement and additional material in their final assessment to each criterion (see grey boxes at the end of each chapter).

Taking into account the additional information and the comments given by the university, the peers summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2022
Ma Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*
Ba Automation and Control	with requirements for one year	EUR-ACE®	30.09.2023
Ma Automation and Control	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*

Requirements

For all programmes

A 1. (ASIIN 1.1, 1.3) Draft a lean competence profile focusing on the academic, discipline-related, and professional qualifications of graduates of each programme. Make it available to both, students and teaching staff, so that they may refer to it, for instance in the course of internal quality assurance procedures. Make sure that it is consistently communicated and include it also into the respective Diploma Supplement.

A 2. (ASIIN 5.1) Rewrite the module descriptions so as to include necessary information about the qualification objectives, usability in other degree programmes, exams and grading, workload (in relation to Kazakh and ECTS credits), frequency of offer, and duration of each module. Provide completed module handbooks and ensure the accessibility of the updated module descriptions for students and lecturers.

A 3. (ASIIN 5.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes ("qualification profile"), structure and level of the degree, as well as about the individual performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems. In addition to the final degree, statistical data according to ECTS-Users guide have to be shown.

For the Bachelor's degree programme Electrical Engineering

A 4. (ASIIN 1.2, 1.3) Adapt the English name of the programme so that it adequately reflects its Electrical Power Engineering-focus and at the same time corresponds to the original Russian title.

For the Master's degree programmes

A 5. (ASIIN 4.1) Provide a concept for the further development of the teaching staff towards an international research profile (international publications, projects etc.) so as to acquire the intended research-oriented objectives. Provide evidence for initial steps towards its implementation.

A 6. (ASIIN 4.3) Build up research labs in order to foster research work and, thus, to facilitate adequate research competences of the students. To that end, prepare a schedule for the build-up and provide evidence for initial steps towards its implementation.

For the Master's degree programme Electrical Engineering

A 7. (ASIIN 1.3) Complement the curriculum with regard to the student's competences in core areas like Power Electronics, Smart Grids etc.

For the Master's degree programme Automation and Control

A 8. (ASIIN 1.3) Complement the curriculum regarding student's competences in advanced topics of control theory.

Recommendations

For all programmes

E 1. (ASIIN 2.1) It is recommended to improve the English language skills of both, the teaching staff and the students, in order to initiate an increased international mobility on both sides.

E 2. (ASIIN 2.2, 6) It is recommended to monitor the actual student workload in order to either adapt the amount of allocated (Kazakh / ECTS) credit points or the content of the module in case of significant deviations.

E 3. (ASIIN 6) It is recommended to further develop the reporting and documentation system in order to make better and more transparent use of the qualitative and quantitative data gathered in the framework of the quality management system in place.

For the Bachelor's and Master's degree programme Automation and Control

E 4. (ASIIN 1.2, 1.3) It is recommended to reconsider the name of the programme with respect to its primary focus on process automation and process control.

For the Master's degree programmes

E 5. (ASIIN 3) It is recommended to institutionalize the coordination of the thesis supervision between the university and the companies.

G Comment of the Technical Committee 02 – Electrical Engineering and Information Technology (Circulation procedure September 2016)

Assessment and analysis for the award of the ASIIN seal:
The Technical Committee fully accepts the assessments and recommended resolution of the expert panel. In particular, it agrees with the proposal of a shortened accreditation period for the Master's programmes. To that end, it considers the documented research capacity of the Departments as well as the proven research capabilities of the academic staff to be decisive.

Assessment and analysis for the award of the EUR-ACE® Label:
The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the engineering specific part of its own Subject-Specific Criteria.

The Technical Committee recommends the award of the seals as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditation**
Ba Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2022
Ma Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*
Ba Automation and Control	with requirements for one year	EUR-ACE®	30.09.2023
Ma Automation and Control	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*

H Decision of the Accreditation Commission (30.09.2016)

Assessment and analysis for the award of the subject-specific ASIIN seal:

The Accreditation Commission thoroughly discusses the critical assessment of the content of the Master's programmes and, moreover, the laboratory equipment and research capacities contributing not only to the research objectives of the faculty but also to the quality development of the Master's programmes. It intensively debates whether the actual state of these programmes does already justify their accreditation or rather suggest a suspension of the procedure concerning these programmes. Eventually, the Accreditation Commission concluded to follow the peers' proposal of a *shortened accreditation period* for the said Master's programmes. This might spur their development while at the same time ensure that the minimum quality standards in regard to the ASIIN Criteria and the demands of the European Qualification Framework-level 7 for Master's programmes are maintained.

Referring to the curriculum of the study programmes in Automation and Control, the Accreditation Commission comes to the conclusion that the breadth of the curricular content of the programmes fits well with its name, so that the peers' proposal to more closely address the perceived focus on process automation and process control appears to be misjudged. Following that assumption, the Accreditation Commission decides deleting a respective recommendation.

For the rest, the Accreditation Commission fully agrees with the assessment and recommended resolution of the peers and the Technical Committee.

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

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the engineering specific parts of Subject-Specific Criteria of the Technical Committee 02 – Electrical Engineering and Information Technology.

The Accreditation Commission for Degree programmes decides to award the following seals:

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Ba Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2022
Ma Electrical Engineering	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*
Ba Automation and Control	with requirements for one year	EUR-ACE®	30.09.2023
Ma Automation and Control	with requirements for one year	EUR-ACE®	30.09.2019 *shortened accreditation period*

Requirements

For all programmes

A 1. (ASIIN 1.1, 1.3) Draft a lean competence profile focusing on the academic, discipline-related, and professional qualifications of graduates of each programme. Make it available to both, students and teaching staff, so that they may refer to it, for instance in the course of internal quality assurance procedures. Make sure that it is consistently communicated and include it also in the respective Diploma Supplement.

A 2. (ASIIN 5.1) Rewrite the module descriptions so as to include necessary information about the qualification objectives, usability in other degree programmes, exams and grading, workload (in relation to Kazakh and ECTS credits), frequency of offer, and duration of each module. Provide completed module handbooks and ensure the accessibility of the updated module descriptions for students and lecturers.

A 3. (ASIIN 5.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes (“qualification profile”), structure and level of the degree, as well as about the individual performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems. In addition to the final degree, statistical data according to ECTS-Users guide have to be shown.

For the Bachelor's and the Master's degree programmes Electrical Engineering

A 4. (ASIIN 1.2, 1.3) Adapt the English name of the programme so that it adequately reflects its Electrical Power Engineering-focus and at the same time corresponds to the original Russian title.

For the Master's degree programmes

A 5. (ASIIN 4.1) Provide a concept for the further development of the teaching staff towards an international research profile (international publications, projects etc.) so as to acquire the intended research-oriented objectives. Provide evidence for initial steps towards its implementation.

A 6. (ASIIN 4.3) Build up research labs in order to foster research work and, thus, to facilitate adequate research competences of the students. To that end, prepare a schedule for the build-up and provide evidence for initial steps towards its implementation.

For the Master's degree programme Electrical Engineering

A 7. (ASIIN 1.3) Complement the curriculum with regard to the student's competences in core areas like Power Electronics, Smart Grids etc.

For the Master's degree programme Automation and Control

A 8. (ASIIN 1.3) Complement the curriculum regarding student's competences in advanced topics of control theory.

Recommendations

For all programmes

E 1. (ASIIN 2.1) It is recommended to improve the English language skills of both, the teaching staff and the students, in order to initiate an increased international mobility on both sides.

E 2. (ASIIN 2.2, 6) It is recommended to monitor the actual student workload in order to either adapt the amount of allocated (Kazakh / ECTS) credit points or the content of the module in case of significant deviations.

E 3. (ASIIN 6) It is recommended to further develop the reporting and documentation system in order to make better and more transparent use of the qualitative and quantitative data gathered in the framework of the quality management system in place.

For the Master's degree programmes

E 4. (ASIIN 3) It is recommended to institutionalize the coordination of the thesis supervision between the university and the companies.

I Fulfilment of Requirements (30.06.2017)

Analysis of the peers and the Technical Committee (June 2017)

Requirements

For all degree programmes

A 1. (ASIIN 1.1, 1.3) Draft a lean competence profile focusing on the academic, discipline-related, and professional qualifications of graduates of each programme. Make it available to both, students and teaching staff, so that they may refer to it, for instance in the course of internal quality assurance procedures. Make sure that it is consistently communicated and include it also in the respective Diploma Supplement.

Initial Treatment	
Peers	barely fulfilled Statement: Basically, competence profiles have been changed along the lines of the academic, discipline-related, and professional qualifications of graduates. Taking into account the general weakness in English, the majority of the peers consider this task as fulfilled. One peer considers the requirement *not* fulfilled. Concerning the Electrical Engineering programmes, he argues that the new summary of educational and learning objectives is far too voluminous to be used as a short-cut competence profile, which also fits into the Diploma Supplement. And with respect to the Automation and Control programmes, the revised version of programme-related learning outcomes is found to be acceptable but apparently not published yet.
TC 02	*not* fulfilled Statement: The Technical Committee agrees with the dissenting peer in judging the requirement not fulfilled satisfactorily, noting also that this assessment is to be differentiated for the Electrical Engineering programmes on the one hand and the Automation and Control programmes on the other.

A 2. (ASIIN 5.1) Rewrite the module descriptions so as to include necessary information about the qualification objectives, usability in other degree programmes, exams and grading, workload (in relation to Kazakh and ECTS credits), frequency of offer, and duration of each module. Provide completed module handbooks and ensure the accessibility of the updated module descriptions for students and lecturers.

Initial Treatment	
Peers	*not* fulfilled Statement: *BaMa Elektrical Engineering*: Module descriptions could not be found. Thus, the task is *not* fulfilled. *BaMa Automation and Control*: Module descriptions are still insufficient, partly still in Russian. Thus, the task is *not* fulfilled.
TC 02	*not* fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the majority of the peers, noting also that the judgment must be differentiated for the Electrical Engineering programmes on the one hand and the Automation and Control programmes on the other.

A 3. (ASIIN 5.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes (“qualification profile”), structure and level of the degree, as well as about the individual performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems. In addition to the final degree, statistical data according to ECTS-Users guide have to be shown.

Initial Treatment	
Peers	*not* fulfilled Statement: No diploma supplement could be found for any of the degree programmes. There is an “Addendum to Diploma” being in fact a classical transcript of records, but no diploma supplement. Thus, the task is *not* fulfilled.
TC 02	*not* fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the majority of the peers.

For the Bachelor's and the Master's degree programmes Electrical Engineering

A 4. (ASIIN 1.2, 1.3) Adapt the English name of the programme so that it adequately reflects its Electrical Power Engineering-focus and at the same time corresponds to the original Russian title.

Initial Treatment	
Peers	fulfilled Statement: The English name of the respective programme has been shifted to "Electrical power engineering" in order to make the focus on energy topics more evident.
TC 02	fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the peers.

For the Master's degree programmes

A 5. (ASIIN 4.1) Provide a concept for the further development of the teaching staff towards an international research profile (international publications, projects etc.) so as to acquire the intended research-oriented objectives. Provide evidence for initial steps towards its implementation.

Initial Treatment	
Peers	*not* fulfilled Statement: No measures are being taken to follow the request to build up an international research profile. The cited papers have mainly been published within Kazakhstan, but are internationally irrelevant and even hard to be found and read anyway. Overall, there is no clear-cut concept to improve the international research profile so that the task is *not* fulfilled.
TC 02	*not* fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the majority of the peers.

A 6. (ASIIN 4.3) Build up research labs in order to foster research work and, thus, to facilitate adequate research competences of the students. To that end, prepare a schedule for the build-up and provide evidence for initial steps towards its implementation.

Initial Treatment	
Peers	fulfilled Statement: New labs are being planned and about to be implemented. Based on the assumption that they indeed *will* be implemented according to these plans, the task is fulfilled.

	Electrical Engineering programmes: The envisioned new labs will provide good facilities to increase activities in the field of applied research. *Automation and Control programmes*: The HEI describes planning procedures and investments for the "Green Energy Lab" which also offers adequate opportunities to do academic research.
TC 02	fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the peers.

For the Master's degree programme Electrical Engineering

A 7. (ASIIN 1.3) Complement the curriculum with regard to the student's competences in core areas like Power Electronics, Smart Grids etc.

Initial Treatment	
Peers	fulfilled / not fulfilled Statement: One of the peers with particular expertise in the field of Power Engineering concludes that though there are certain curricular modifications, none of the suggested topics has been introduced into the curriculum.
TC 02	*not* fulfilled Statement: The Technical Committee agrees with the assessment of one of the experts in the field who came to the conclusion that the requirement is not fulfilled yet.

For the Master's degree programme Automation and Control

A 8. (ASIIN 1.3) Complement the curriculum regarding student's competences in advanced topics of control theory.

Initial Treatment	
Peers	fulfilled Statement: Modifications in the curriculum have been implemented to enlarge the number of competences in advanced topics of control theory. One peer insists that the respective curricular modifications do not include any state-of-the-art contents which could be considered advanced topics in control theory.
TC 02	fulfilled Statement: The Technical Committee agrees with the assessment and recommended resolution of the majority of the peers.

Decision of the Accreditation Commission (30.06.2017)

Assessment:

The Accreditation Commission agrees with the peers that a series of requirements for all degree programmes cannot be considered fulfilled at the time and thus decides to prolong the accreditation of the degree programmes for another six months in order to give the university the opportunity to fully comply with the accreditation criteria.

The Accreditation Commission decides to extend the award of the seals as follows:

Degree Programme	**ASIIN seal**	**Subject-specific labels**	**Maximum duration of accreditation**
Ba Electrical Power Engineering	requirement 1, 2, 3 *not* fulfilled	EUR-ACE	6 months prolongation
Ma Electrical Power Engineering	requirement 1, 2, 3, 5, 7 *not* fulfilled	EUR-ACE	6 months prolongation
Ba Automation and Control	requirement 1, 2, 3 *not* fulfilled	EUR-ACE	6 months prolongation
Ma Automation and Control	requirement 1, 2, 3, 5 *not* fulfilled	EUR-ACE	6 months prolongation

Statement

With respect to requirement 1:

Concerning the Electrical Engineering programmes, the new summary of educational and learning objectives is far too voluminous to be used as a short-cut competence profile, which also fits into the Diploma Supplement. And with respect to the Automation and Control programmes, the revised version of programme-related learning outcomes is found to be acceptable but still not published appropriately.

With respect to requirement 2:

A revision of the module descriptions for the Electrical Engineering programmes has not been evidenced. Regarding the Automation and Conrol programmes, the module descriptions are still insufficient, partly still drafted in Russian.

With respect to requirement 3:

No diploma supplement could be found for any of the degree programmes. There is an “Addendum to Diploma” being in fact a classical transcript of records, but no diploma supplement as required in the accreditation decision.

With respect to requirement 5:

Apparently, no measures have been taken so far to develop an international research profile. The cited papers have mainly been published within Kazakhstan, but are internationally irrelevant and even hard to be found and read anyway. Overall, there is no clear-cut concept to improve the international research profile.

With respect to requirement 7:

Though there are certain curricular modifications, neither the suggested topics aiming at improving the students' competences in the field of Electrical Power Engineering (like Power Electronics, Smart Grids etc.) nor any other change to this end have been introduced into the curriculum.

J Fulfilment of remaining Requirements (23.03.2018)

Analysis of the peers and the Technical Committee (13.03.2018)

Requirements

For all degree programmes

A 1. (ASIIN 1.1, 1.3) Draft a lean competence profile focusing on the academic, discipline-related, and professional qualifications of graduates of each programme. Make it available to both, students and teaching staff, so that they may refer to it, for instance in the course of internal quality assurance procedures. Make sure that it is consistently communicated and include it also in the respective Diploma Supplement.

Secondary Treatment	
Peers	fulfilled Justification: As mentioned in the report, the competence profiles have been defined and can be downloaded for the Bachelor level and for the Master level. For the Bachelor level, the profiles comprise socio-personal, economic, organizational, managerial and professional competences. Interestingly, there are apparently no scientific competences on a Bachelor level. Correspondingly, at the Master level, there are 'general scientific and professional competences', but no economic competences anymore. Still, the listed competences follow the general Bologna approach so that the requirement can be considered fulfilled.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

A 2. (ASIIN 5.1) Rewrite the module descriptions so as to include necessary information about the qualification objectives, usability in other degree programmes, exams and grading, workload (in relation to Kazakh and ECTS credits), frequency of offer, and

duration of each module. Provide completed module handbooks and ensure the accessibility of the updated module descriptions for students and lecturers.

Secondary Treatment	
Peers	fulfilled Justification: The updated versions of the module handbooks can be downloaded for the different programmes. In spite of minor issues concerning the clarity of certain parts of the module handbooks (e.g. it is rather obscure what is meant by 'Knowledge of the courses of the curriculum of the secondary school' under 'Recommended prerequisites' in the Bachelor module handbook 'Electrical Power Engineering'), the requirement can be considered fulfilled.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

A 3. (ASIIN 5.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes ("qualification profile"), structure and level of the degree, as well as about the individual performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems. In addition to the final degree, statistical data according to ECTS-Users guide have to be shown.

Secondary Treatment	
Peers	fulfilled Justification: The diploma supplements have been provided and can be downloaded. The exact definition of, the grades ('Bachelor of engineering and technology' and 'Master of Technical Sciences') correspond to the aforementioned competence profiles so that the requirement can be considered fulfilled.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

For the Master's degree programmes

A 5. (ASIIN 4.1) Provide a concept for the further development of the teaching staff towards an international research profile (international publications, projects etc.) so as to acquire the intended research-oriented objectives. Provide evidence for initial steps towards its implementation.

Secondary Treatment	
Peers	fulfilled Justification: It goes without saying that a long-term and sustainable development of teaching staff towards an international research profile requires far more than a concept. The latter can be at most a necessary, not a sufficient condition to develop such a profile. The necessary activities to provide the profile have indeed been started and are evidenced by the supporting actions and partners mentioned in the report. Thus, the requirement can be considered fulfilled.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

For the Master's degree programme Electrical Engineering

A 7. (ASIIN 1.3) Complement the curriculum with regard to the student's competences in core areas like Power Electronics, Smart Grids etc.

Secondary Treatment	
Peers	fulfilled Justification: On the Bachelor and Master levels, there are different appearances of power electronics. The only module containing certain aspects of smart grids is 'Controlled AC transmission systems in electric power engineering' on the Master level. The requirement clearly addresses only an initial introduction of concepts in the field of power electronics and smart grids. Therefore, the requirement can be considered fulfilled.
TC 02	fulfilled Justification: The Technical Committee agrees with the assessment of the peers.

Decision of the Accreditation Commission (23.03.2018)

The Accreditation Commission decides to extend the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific labels	Duration of accreditation
Ba Electrical Power Engineering	requirements 1, 2, 3 fulfilled	EUR-ACE	30.09.2022
Ma Electrical Power Engineering	requirements 1, 2, 3, 5, 7 fulfilled	EUR-ACE	30.09.2019

Degree Programme	ASIIN seal	Subject-specific labels	Duration of accreditation
Ba Automation and Control	requirements 1, 2, 3 fulfilled	EUR-ACE	30.09.2023
Ma Automation and Control	requirements 1, 2, 3, 5 fulfilled	EUR-ACE	30.09.2019

Annex: Learning Outcomes and Curricula

According to the document "Engineer's Profile" (Annex 1) in the SAR the following **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Electrical Engineering:

"1) Research: [graduates...]

- [conduct] experimental research of electric power systems;
- [apply] methods for planning experiments and statistical processing of data;
- [apply] methods of mathematical modelling of electric power systems;
- [conduct] literature and patent search, preparation of reports, surveys, certificates, etc.

2) Production and technological activity: [graduates...]

- [are] involved in the implementation of technological processes of electric power systems;
- [deal with] process control of electric power systems based on modern means of power converter technology:
- [are] involved in the implementation of measures to protect the environment;
- [are] involved in the implementation of energy-saving technologies in various industries, housing and communal services;
- [are able to implement] measures to ensure product quality.

3) Organizational and administrative activity: [graduates...]

- [plan and organize] production in the workplace;
- [provide for] information support and preparation of necessary technical documentation;
- [participate] in product quality control;
- [organize] labour activity of staff, setting goals,
- [decide on] questions of logistics in the workplace.

4) Calculation and design activity: [graduates…]

- [participate] in the development of a method for receiving and converting electrical energy;
- [participate] in the development of measures to protect the environment;
- [participate] in the development of energy-saving technologies in various industries, housing and communal services;
- [conduct] power calculations, selection and sizing of electrical equipment, apparatus and devices of relay protection and automation of electric power systems.

- [develop] electrical circuits of electrical equipment, buildings and structures;
- [select] main and auxiliary electrical equipment, ballasts, devices of relay protection and automation projects.

5) Service and operational activities: [graduates…]

- [maintain] technological main and auxiliary electrical equipment, ballasts, circuits of relay protection and automation of electric power systems;
- [plan and carry out] repair work of electrical equipment and power lines.

6) Installation and commissioning activities: [graduates…]

- [do the] installation of electrical equipment, devices of relay protection and automatics, power lines in various industries, housing and communal services;
- [take responsibility for] commissioning and commissioning of main and auxiliary electrical equipment, ballasts."

The following **curriculum** is presented:

Annex 5. Study Plan BA

Semester	code of discipline	Discipline	Blocks of disciplines (ECTS credits)				
			Natural sciences and mathematics	Special and general professional disciplines		Humanitarian and socio-economic sciences	other
				Engineering discipline	Engineering design		
1	Mat1201	Mathematics I	6				
1	Fiz1202	Physics I	6				
1	Him1203	Chemistry	5				
1	SSM1204	Standardization, certification, and metrology	5				
1	Eko2105	Ecology and sustainable development	5				
1	OE2106	General power engineering		5			
2	IK1101	History of Kazakhstan				5	
2	K(R)Ya1102	Kazakh (Russian) language				5	

2¤	NGKG1210¤	Descriptive·geometry·and·computer·graphics¤	6¤	¤	¤	¤	¤
2¤	Mat1201¤	Mathematics·II¤	6¤	¤	¤	¤	¤
2¤	Fiz2202¤	Physics·II¤	5¤	¤	¤	¤	¤
2¤	Inf1104¤	Information·science¤	5¤	¤	¤	¤	¤
3¤	IYa1103¤	Foreign·language¤	¤	¤	¤	5¤	¤
3¤	DGYa2104¤	Office·work·in·state·language¤	¤	¤	¤	3¤	¤
3¤	ME2211¤	Mathematics·in·Power·Eclectics¤	¤	2¤	¤	¤	¤
3¤	EM2303¤	Electrical·and·technical·material·science¤	¤	5¤	¤	¤	¤
3¤	TOE2203¤	Theory·of·electrical·engineering·1¤	5¤	¤	¤	¤	¤
3¤	IIT3301¤	Information·and·measuring·technics.¤	¤	5¤	¤	¤	¤
3¤	SE2214¤	Power·Electronics¤	¤	5¤	¤	¤	¤
3¤	SPE2302¤	Power·energy·converter¤	¤	¤	5¤	¤	¤
4¤	Fil2106¤	Philosophy¤	¤	¤	¤	5¤	¤
4¤	Kul2101¤	Culturology¤	¤	¤	¤	5¤	¤

4¤	OP2102¤	Basics·of·law¤	¤	¤	¤	5¤	¤
4¤	PM2214¤	Applied·mechanics¤	¤	5¤	¤	¤	¤
4¤	TOE2203¤	Theory·of·electrical·engineering·2¤	¤	5¤	¤	¤	¤
4¤	PF2216¤	Applied·physics¤	¤	5¤	¤	¤	¤
4¤	AUE(I)2201¤	Automatic·control·of·energy·I¤	¤	5¤	¤	¤	¤
4¤	CSE2202¤	Digital·systems·in·the·energy¤	¤	5¤	¤	¤	¤
4¤	KTYa2203¤	Kazakh·technical·language¤	¤	¤	¤	5¤	¤
4¤	RTYa2204¤	Russian·technical·language·¤	¤	¤	¤	5¤	¤
4¤	ITYa2205¤	Foreign·technical·language¤	¤	¤	¤	5¤	¤
4¤	¤	Teaching·practice¤	¤	¤	¤	¤	5¤
5¤	AUE(II)3206¤	Automatic·control·of·energy·II¤	¤	5¤	¤	¤	¤
5¤	RES3207¤	Modes·of·power·systems¤	¤	5¤	¤	¤	¤
5¤	EA3208¤	Electric·apparatus¤	¤	5¤	¤	¤	¤
5¤	EOESP3209¤	Electric·Equipment·of·Electric·Power·Stations·&·Substations¤	¤	5¤	¤	¤	¤

5¤	EM3302¤	Electric·machines¤	¤	¤	7¤	¤	¤
5¤	→ EEO3305 →	Electromechanics·and·electric·equipment¤	¤	¤	¤	¤	¤
5¤	Ele3304¤	Electric-power·industry¤	¤	¤	¤	¤	¤
6¤	Pol3103¤	Political·science¤	¤	¤	¤	5¤	¤
6¤	Soc3104¤	Sociology¤	¤	¤	¤	5¤	¤
6¤	TAEP3210¤	Theory·of·automated·electric·drive¤	¤	5¤	¤	¤	¤
6¤	ASE3309¤	Automatic·systems·of·electrical·engineering¤	¤	5¤	¤	¤	¤
6¤	EChE3306¤	Electric·part·of·power·station¤	¤	5¤	¤	¤	¤
6¤	ESS3307¤	Electric-power·networks·and·systems¤	¤	5¤	¤	¤	¤
6¤	EP3308¤	Power·supply·of·enterprices¤	¤	¤	7¤	¤	¤
6¤	¤	Internship¤	¤	¤	¤	¤	5¤
7¤	BZhOT4221¤	Life·and·labour·safety¤	¤	5¤	¤	¤	¤
7¤	ETUP4222¤	Economic·theory·and·production·¤	5¤	¤	¤	¤	¤
7¤	PPE4212¤	Transition·processes·in·energy·systems¤	¤	5¤	¤	¤	¤

7¤	PPSE4213¤	Transition·processes·is·power-supply·systems¤	¤	5¤	¤	¤	¤
7¤	OE4301¤	Basics·of·electrical¤	¤	5¤	¤	¤	¤
7¤	TBE4302¤	Safety·in·electrical·in·installations¤	¤	5¤	¤	¤	¤
7¤	RZE4304¤	Relay·protection·of·electrical·equipment¤	¤	5¤	¤	¤	¤
7¤	RZE4303¤	Relay·protection·of·power·systems¤	¤	5¤	¤	¤	¤
7¤	RPE····· SP4305¤	Calculation·and·projecting·of·electric·power·station·and·substation¤	¤	¤	7¤	¤	¤
7¤	RPESS4306¤	Calculation·and·Projecting·of·power·network·and·systems·¤	¤	¤	7¤	¤	¤
7¤	RPSE4307¤	Calculation·and·projecting·of·power-supply·systems¤	¤	¤	7¤	¤	¤
7¤	RPSAEK4308¤	Calculation·and·projecting·complexes·automation·systems¤	¤	¤	7¤	¤	¤
8¤	¤	Undergraduate·practice¤	¤	5¤	¤	¤	¤
8¤	¤	Graduate·work·(graduation·project)¤	¤	¤	28¤	¤	¤
8¤	¤	SAC·for·specialization¤	¤	¤	¤	¤	¤
Total·for·each·block¤			59¤	127·····75¤		48¤	10¤
The·total·amount·of·the·program·(loan·amount·for·all·units)¤			**319¤**				

According to the document “Engineer’s Profile” (Annex 1) in the SAR the following **learning outcomes (intended qualifications profile)** shall be achieved by the Master’s degree programme Electrical Engineering:

7) Research and development[: the graduate...]

- conducts technological, electrical power calculations;
- calculates and selects the main auxiliary electrical equipment, apparatus, means of relay protection and automation of electric power systems;
- develops or selects the electrical circuitry of the electrical equipment of buildings and structures;
- develops simulation models of power systems.

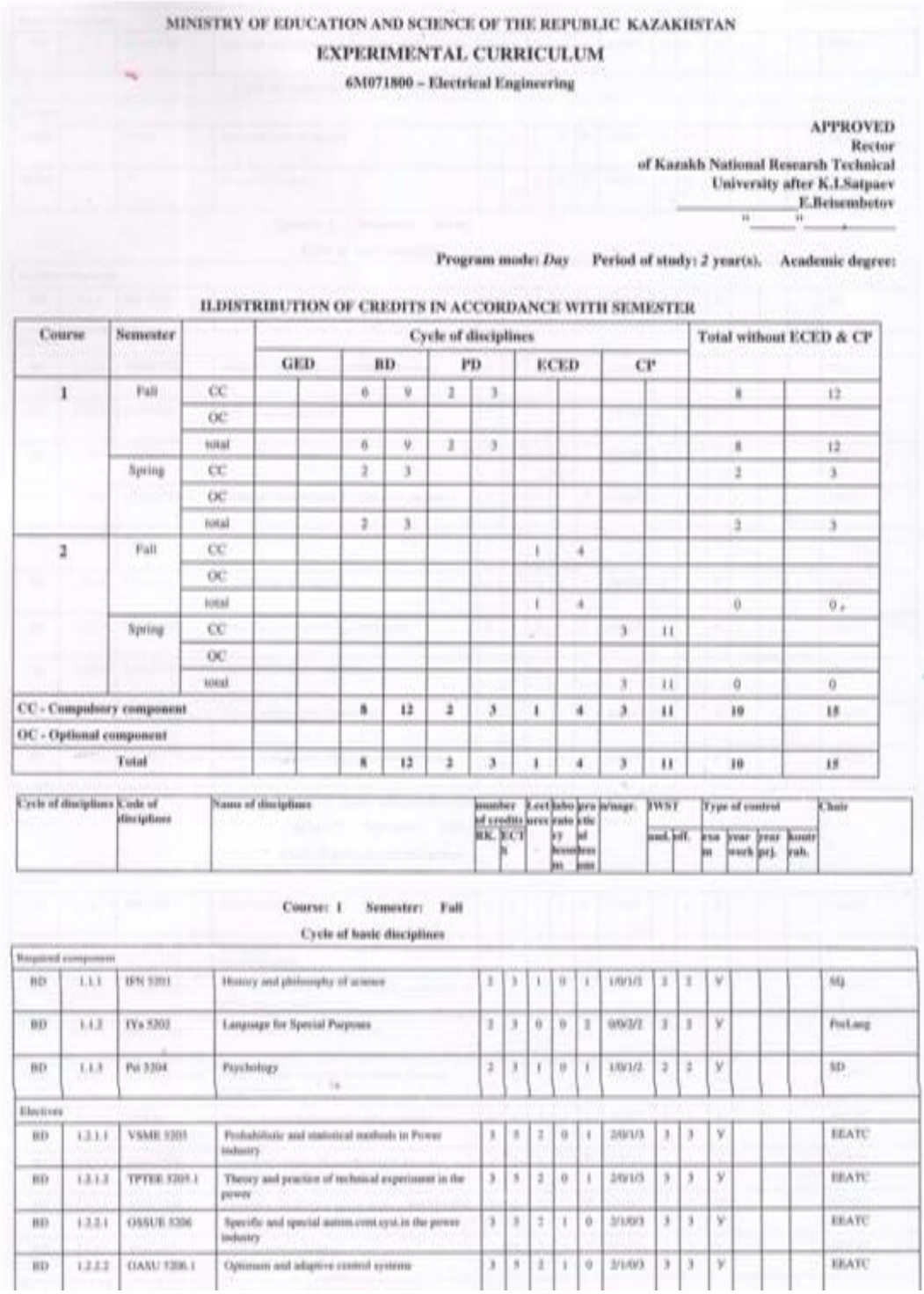
8) Design and technological activity[: the graduate...]

- develops ways to receive and send electrical and other forms of energy;
- develops an optimal scheme of power supply, transmission of electricity, and justifies the effective operating parameters and indicators;
- develops energy-saving technologies in various industries, housing and communal services;
- develops actions for environmental protection for various industries, housing and communal services.

9) Research[: the graduate...]

- conducts literature and patent search, reports, summaries, conclusions, etc.
- carries out the planning of experimental research, selects research methods.

The following **curriculum** is presented:



MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC KAZAKHSTAN

EXPERIMENTAL CURRICULUM

6M071800 – Electrical Engineering

APPROVED
Rector
of Kazakh National Research Technical
University after K.I.Satpaev
_____E.Beisembetov
"____" _____

Program mode: *Day* Period of study: *3* year(s). Academic degree:

II.DISTRIBUTION OF CREDITS IN ACCORDANCE WITH SEMESTER

Course	Semester		Cycle of disciplines								Total without ECED & CP	
			GED		BD		PD		ECED		CP			
1	Fall	CC			6	9	2	3					8	12
		OC												
		total			6	9	2	3					8	12
	Spring	CC			2	3							2	3
		OC												
		total			2	3							2	3
2	Fall	CC							1	4				
		OC												
		total							1	4			0	0
	Spring	CC									3	11		
		OC												
		total									3	11	0	0
CC - Compulsory component					8	12	2	3	1	4	3	11	10	15
OC - Optional component														
Total					8	12	2	3	1	4	3	11	10	15

Cycle of disciplines	Code of disciplines	Name of disciplines	number of credits		Lect ures	labo rato ry less ons	pra ctic al less ons	n/supr.	IWST		Type of control				Chair
			RK	ECT S					aud.	stf.	exa m	year work	year prj.	kontr rab.	

Course: 1 Semester: Fall

Cycle of basic disciplines

Required components																
BD	1.1.1	IFN 5201	History and philosophy of science	3	5	1	0	1	1/0/1/1	3	3	Y				SDj
BD	1.1.2	IYa 5202	Language for Special Purposes	3	5	0	0	3	0/0/3/2	3	3	Y				ForLang
BD	1.1.3	Ps 5204	Psychology	2	3	1	0	1	1/0/1/2	2	2	Y				SD
Electives																
BD	1.2.1.1	VSME 5205	Probabilistic and statistical methods in Power industry	3	5	2	0	1	2/0/1/3	3	3	Y				EEATC
BD	1.2.1.2	TPTEE 5205.1	Theory and practice of technical experiment in the power	3	5	2	0	1	2/0/1/3	3	3	Y				EEATC
BD	1.2.2.1	OSSUE 5206	Specific and special autom.cont.syst.in the power industry	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
BD	1.2.2.2	OASU 5206.1	Optimum and adaptive control systems	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC

Cycle of professional disciplines

Required component																	
PD	2.1.1	NTPE 5301	Scientific and technical problems of electric power	3	3	1	0	1	1/0/1/3	3	3	Y				EEATC

Cycle of extra curricular educational disciplines

Electives																	
ECED		NIRM	Research work of master's	1	4	0	0	0	0/0/0/0	0	0					EEATC
ECED	3	IP	Research Practice	3	13	0	0	0	0/0/0/0	0	0					EEATC

Course: 1 Semester: Spring

Cycle of basic disciplines

Required component																	
BD	1.1.4	Ped 5303	Pedagogy	3	3	1	0	1	1/0/1/3	3	3	Y				ED
Electives																	
BD	1.2.3.1	MPSD 5207	Methods of teaching professional disciplines	2	3	1	0	1	1/0/1/2	2	3	Y				EEATC
BD	1.2.3.2	OPMS207.1	Bases of pedagogical skill	2	3	1	0	1	1/0/1/2	2	3	Y				EEATC
BD	1.2.4.1	NE 5208	Reliability in power	2	3	1	0	1	1/0/1/2	2	3	Y				EEATC
BD	1.2.4.2	ICTNO 5208.1	Computer technologies in science and education	2	3	1	1	0	1/1/0/2	2	3	Y				EEATC
BD	1.2.5.1	SE 5209	Power Electronics	2	3	1	1	0	1/1/0/2	2	3	Y				EEATC
BD	1.2.5.2	FT 5209.1	Transformative hardware	2	3	1	1	0	1/1/0/2	2	2	Y				EEATC
BD	1.2.6.1	TPRZ 5210	Theory and practice of relay protection	3	5	2	0	1	2/0/1/3	3	3	Y				EEATC
BD	1.2.6.2	MRZ 5210.1	Microprocessor relay protection	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
BD	1.2.7.1	TAEP 5211	Theory of automated electric drive	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
BD	1.2.7.2	TEMPE 5211.1	Theory of electromechanical transformation of energy	3	5	2	0	1	2/0/1/3	3	3	Y				EEATC

Cycle of extra curricular educational disciplines

Course: 2 Semester: Fall

Cycle of professional disciplines

Electives																	
PD	2.2.4.1	VIE 6304	Renewable energy	3	3	1	1	0	1/1/0/3	3	3	Y				EEATC
PD	2.2.4.2	MERRE 6304.1	Management of power complexes and regulation of the energy sector	2	3	1	1	0	1/1/0/2	2	2	Y				EEATC
PD	2.2.5.1	PTAES 6305	Against emergency and technological automation of power supply systems	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
PD	2.2.5.2	CSUE 6305.1	Digital control systems of electric	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
PD	2.2.6.1	ASDUOR 6308	ASDC and optimization of the modes of power supply systems	3	5	1	1	1	1/1/1/3	3	3	Y				EEATC
PD	2.2.6.2	EE 6308.1	Energy saving in electrical supply networks	3	5	1	1	1	1/1/1/3	3	3	Y				EEATC
PD	2.2.7.1	MNEE 6306	Installation, setup and maintenance of electric equipment	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
PD	2.2.7.2	EESS 6306.1	Operation of electrical power systems and networks	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
PD	2.2.8.1	YVN 6307	High voltage technology	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC
PD	2.2.8.2	VETO 6307.1	High voltage electrical technologies and equipment	3	5	2	1	0	2/1/0/3	3	3	Y				EEATC

Cycle of extra curricular educational disciplines

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

Course: 2 Semester: Spring

Cycle of extra curricular educational disciplines

Required component																	
DP&W		Ozmd	Master's Thesis Processing and Defense	3	11	0	0	0	0/0/0/0	0	0					EEATC

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

- *In the field of experimental research*: analysis of the problem of research in a given area on the basis of selection and study of literature and patent sources; diagnosis of the condition and dynamics of objects activity (materials, processes, equipment in various industries with the necessary tools and methods of analysis); the 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 simulations to solve this 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 field of computational and design and analysis*: formulation of goals and objectives of the project (program) according to issued criteria, the objective function and constraints; 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; project development [applying] engineering equipment based on mechanical, technological, design, performance, ergonomic, aesthetic and economic parameters; use of information technology to select the necessary equipment and materials in the manufacture of [final] products;
- *In the field of industrial and technological activities*: conducting physical and experimental studies using modern methods of measurement and processing of the results; introduction of production processes, quality control of components and assemblies for different purposes, calculation of production standards [and] technological standards in the flow of materials [and] tools, selection [of] standard equipment; preliminary assessment of the economic efficiency of operations; 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 [final] product; standardization and certification of engineering equipment and processes and at their manufacturing and repair; environmental control production; participation in work on fine-tuning and development of technological processes in the manufacture of products of the process engineering industry;
- *In the area of service and operational 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 setup, 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 of plans for various kinds of works and control of their implementation, including the provision of appropriate services [and] 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; implementation of the technical control of works;

- *In the field of software and management activities*: construction of process control software for creating new materials; Computer choice of materials and equipment for the manufacture of finished engineering products; the use of computer technology for geographic information systems; information provision devices and systems.
- *In the field of educational and pedagogical activities*: provision of high-quality trans tasks of skills and knowledge and the ability to work with the staff in their training.

The main requirements for the social and ethical competencies of graduates have…

- To 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;
- To 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;
- To be able to adequately orient in different social situations;
- To 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; graduates should…

- have the basics of economic knowledge; have a scientific understanding of the management, marketing, finance, etc.; are able to develop the right strategy to achieve the objectives […];
- be able to express and justify their position on the choice of methods for the solution of tasks; be able to analyze the economic situation [and find ways of] solving this problem and to choose the optimal from an economic point of view, a strategy;
- possess organizational skills; be able to create a mobile working group 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 [their] position on the organizational and administrative activities.
- Know and understand the objectives and methods of state regulation of the economy; know the basic rules and norms of scientific management.

The following **curriculum** is presented:

Automation and Control Bachelor Program - 5B070200

Form of study: daytime ..... Duration of study: 4 years ..... Academic Degree: Bachelor OF engineering and technology

cycle discitis	Discitis code	Name of disciplines	semester	Credits		lectures	laboratory	practice	Individual		Type of control	competence	Chair
				RK	ECTS				with tutor	without tutor			
Module of Social-sciences and language training (14)													
Compulsory component													
OOD 1.1.1	IK 1101	History Of Kazakhstan	1	3	5	2		1	3	3	W	OK-1	ИКиСГД
OOD 1.1.11	OP1109	Basics of Law	1	2	3	1		1	2	2	T	OK-9	ИКиСГД
OOD 1.1.9	Fil 1111	Philosophy	2	3	5	2		1	3	3	T	OK-11	ИКиСГД
OOD 1.1.8	Pol 1110	Politology	2	2	3	1		1	2	2	T	OK-10	ИКиСГД
OOD 1.1.6	Soc1104	Sociology	2	2	3	1		1	2	2	T	OK4	ИКиСГД
OOD 1.1.3	OET1107	Fundamentals of economic theory	2	2	3	1		1	2	2	T	OK-7	ЭП
Module of multilingual training (16)													
Compulsory component													
OOD 1.1.5	K(R)Ya 1106	Kazakh (Russian) language	1	3	5			3	3	3	O	OK-6	Каз.языка
OOD 1.1.7	K(R)Ya 1106	Kazakh (Russian) language	2	3	5			3	3	3	O	OK-6	Каз.языка
OOD 2.1.12	IYa 2108	Foreign language	3	3	5			3	3	3	O	OK-8	Ин.языка
OOD 2.1.13	IYa 2108	Foreign language	4	3	5			3	3	3	O	OK-8	Ин.языка
BD 3.2.14	PK(R)Ya 3207	Professional Kazakh (Russian) language	5	2	3			2	2	2	O	ПК-5	АиУ
BD 3.2.15	POIYa 3207	Professionally Oriented Foreign Language	5	2	3			2	2	2	O	ПК-6	АиУ
Module of fundamental Sciences for Safety and ecology (6)													
Compulsory component													
OOD 1.1.10	OBZ 1103	Basics of Life Safety	1	2	3	1		1	2	2	T	OK3	БЖД ЭОС
OOD 1.1.4	EUR1105	Ecology and Sustainable Development	1	2	3	1		1	2	2	T	OK-5	ПЭ
Elective courses													
BD 3.2.22	OT4221	occupational Safety and Health	6	2	3	1		1	2	2	T	ПК28	ОТ
The module mathematical training (13)													
Compulsory component													
BD 1.2.1	Mat 1201	Higher Mathematics I	1	3	5	2		1	3	3	T	OK-12	Матем
BD 1.2.2	Mat 1202	Higher Mathematics II	2	3	5	2		1	3	3	W	OK-12	Матем
Elective courses													
BD 2.2.7.1	MatIII 2207	Mathematics III	3	3	5	2		1	3	3	T	OK-12	Матем.
BD 2.2.7.1	PM 2207.1	Applied Mathematics	3	3	5	2		1	3	3	T	OK-20	Матем.
BD 2.2.9	MOTS 2208	Mathematical foundations of the theory of systems	4	3	5	2		1	3	3	W	OK-21	АиУ
BD 2.2.9.1	TVMS 2208.1	Probability theory and mathematical statistics	4	3	5	2		1	3	3	W	OK-19	Матем.
Module of Natural science disciplines (12)													
Compulsory component													
BD 1.2.3	Fiz1103	Physics I	2	3	5	1	2		3	3	T	OK-13	ОиТФ
BD 2.2.4	FizII 2204	Physics II	3	3	5	1	2		3	3	T	OK-13	ОиТФ
Elective courses													
BD 2.2.8	Him 2206	Chemistry	3	3	5	2	1		3	3	W	OK-16	ОХ
BD 2.2.8.1	TT 2206.1	Heat engineering and Thermodynamics	3	3	5	2	1		3	3	W	OK-17	МПиТМС
BD 2.2.10	FizIII 2212	Physics III	4	3	5	2		1	3	3	W	OK-13	ОиТФ
BD 2.2.10.1	PF2212.1	Applied Physics	4	3	5	2		1	3	3	W	OK-13	ОиТФ
Module of programming languages (12)													
Compulsory component													
OOD 1.1.2	Inf 1102	Informatics	1	3	5	2	1		3	3	W	OK2	Информ.
DTT	UP	Teaching practice	2	4	2								АиУ
Elective courses													
BD 2.2.11	AP 2209	Algorithmic and Programming	4	3	5	2	1		3	3	T	ПК-1	АиУ
BD 2.2.11.1	TP 2209.1	Programming Technologies	4	3	5	2	1		3	3	T	ПК2	ПОС
BD 2.2.12	PSMS 2213	Software tools systems modeling (Matlab)	4	3	5	1	2		3	3	W	ПК3	АиУ
BD 2.2.12.1	VMKP 2213.1	Computational methods in computer application	4	3	5	2	1		3	3	W	ПК-4	АиУ
BD 3.2.17	PY 3217	Programming in Unity Pro	5	3	5	1	2		3	3	W	ПК-18	АиУ
BD 3.2.17.1	OOP 3217.1	Object-oriented programming	5	3	5	1	2		3	3	W	ПК-17	АиУ
Physical training module (8)													
DTT	FK	Physical education	1	2								OK-22	ФК
DTT	FK	Physical education	2	2								OK-22	ФК
DTT	FK	Physical education	3	2								OK-22	ФК
DTT	FK	Physical education	4	2								OK-22	ФК
The cycle of additional types of training (8)													
DTT	VP	military training	3	2									ВК
DTT	VP	military training	4	2									ВК
DTT	VP	military training	5	2									ВК
DTT	VP	military training	6	2									ВК
Compulsory component													
		SEC on the history of Kazakhstan											
Module of General engineering disciplines (18)													

Compulsory component													
BD-2.2.5	TOE 2205	Theoretical Foundations of Electrical Engineering	3	4	6	2	2		4	4	W	ОК-14	Электротехники
Elective courses													
BD-2.2.6	NGKG 1204	Descriptive geometry and computer drawing	3	3	5	1	2		3	3	W	ОК-15	НГиИГ
BD-2.2.13	PM2211	Applied mechanics	4	3	5	2		1	3	3	T	ОК-18	ПМиОКП
BD-4.2.21	OPP 4220	Organization and planning of production	7	2	3	1		1	2	2	W	ПК-27	МиМП
Compulsory component													
DTT	PP	Industrial practice	4	3	8								АиУ
Elective courses													
BD-3.2.16	EI-3216	Electronics	5	3	5	2	1		3	3	T	ПК-7	РТиТСА
BD-3.2.16.1	ME3216.1	Mikroelektronika	5	3	5	2	1		3	3	T	ПК-8	РТиТСА
BD-3.2.18	MI-3218	Metrology and measurement	5	3	5	2	1		3	3	W	ПК-9	АиУ
BD-3.2.18.1	SS-218.1	Standardization and Certification	5	3	5	2		1	3	3	W	ПК-10	ССиТМ
Module of theoretical foundations of control (15)													
Compulsory component													
PD-3.3.1	LSAR 3301	Linear automatic control system	5	3	5	2	1		3	3	W	ПК-13	АиУ
PD-3.3.3	NSAR 3302	Nonlinear automatic control system	6	3	5	2		1	3	3	W	ПК-14	АиУ
Elective courses													
PD-3.3.2	MMOA 3303	Mathematical modeling automation objects	5	3	5	2	1		3	3	W	ПК-11	АиУ
PD-3.3.2.1	MMOTP 3303.1	Methods of mathematical description of the process	5	3	5	2	1		3	3	W	ПК-16	АиУ
БД-4.2.19	MO-2214	Optimization Methods	7	3	5	2	1		3	3	W	ПК-11	АиУ
BD-4.2.19.1	MP2214.1	Mathematical programming	7	3	5	2	1		3	3	W	ПК-12	АиУ
PD-4.3.7	MIISU 4307	Methods of artificial intelligence in the SU	7	3	5	1	2		3	3	W	ПК-29	АиУ
PD-4.3.7.1	UNL 4307.1	Management based on fuzzy logic	7	3	5	2	1		3	3	W	ПК-30	АиУ
Модуль of software and hardware of automation (12)													
Elective courses													
PD-3.3.4	TSA 3302	Technical automation tools	6	4	7	2	2		3	3	W	ПК-19	АиУ
PD-3.3.4.1	KIP 3302.1	Test and Measurement	6	4	7	2	2		3	3	W	ПК-20	АиУ
PD-3.3.5	EUA 3305	Elements of Automatics	6	3	5	2	1		3	3	T	ПК-21	АиУ
PD-3.3.5.1	RRS 3305.1	Robots and robotic systems	6	3	5	2	1		3	3	T	ПК-22	РТиТСА
PD-3.3.6	MPK 3306	Microprocessor-based systems in the SU	6	3	5	2	1		3	3	W	ПК-23	АиУ
PD-3.3.6.1	PLU 3306.1	Software Logic Control	6	3	5	2	1		3	3	W	ПК-24	АиУ
PD-4.3.9	TSMZI 4309	Technical means and methods of information protection	7	3	5	2		1	3	3	T	ПК-35	ИБ
PD-4.3.9.1	ASZBI 4309.1	Hardware protection and information security	7	3	5	2		1	3	3	T	ПК-36	ИБ
Compulsory component													
DTT	PP	Industrial practice	6	3	8								АиУ
Module of automation and control systems development and designing (11)													

Elective courses												
BD-3.2.20	ATTPP 3220	Automation of typical technological processes and production	6	4	6	1	2	1	4	4	W	ПК-25	АиУ
BD-3.2.20.1	SS3220.1	SCADA-system	6	4	6	2	1	1	4	4	W	ПК-26	АиУ
ПД-4.3.8	PSA 4308	Designing automation systems	7	3	5	2	1		3	3	W	ПК-31	АиУ
PD-4.3.8.1	KTPSU 4308.1	Computer technologies of designing control systems	7	3	5	2	1		3	3	W	ПК-32	АиУ
PD-4.3.10	AUTS 4310	Automation and control in engineering systems	7	4	7	2	2		4	4	T	ПК-29	АиУ
PD-4.3.10.1	ASUTP 4310.1	The automated control system TP	7	4	7	2	2		4	4	T	ПК-30	АиУ
Module of final certification (8)													
Compulsory component													
DTT	PP	Pregraduation practice	8	5	13								АиУ
SEC	GAK	Comprehensive exam	8	1	4								АиУ
DW	NZD	Writing and defense of diploma work	8	2	7								АиУ

According to the SAR (Annex Module Study Plan 1 and 2) the following **learning outcomes (intended qualifications profile)** shall be achieved by the Master's degree programme Automation and Control:

Scientific and pedagogical direction:

Competence,
acquired by students during the development of the educational program
specialty 6M070200 Automation and Control

Mandatory component	
MC 1	Know the role of science in the development of civilization, the relations of science and technology;
MC 2	Owning a high professional level of English;
MC 3	To own ethical and legal standards of conduct pedagogical sing and skills;
MC 4	To know the basic mechanisms of the human psyche;
MC 5	Ability in Management (Management) development, resources and teams in labor and training contexts;
MC 6	Should know the basic micro- and macroeconomic concepts and models, methods of economic analysis of the problems.

Professional competence	
PC 1	Know modern methods of diagnosis to assess the state of the technological equipment;
PC 2	Know modern methods for assessing the reliability of the management of its individual elements;
PC 3	Formation of a creative approach to the organization of scientific - research work;
PC 4	To be able to formulate and solve scientific problems (conduct R & D); to develop, design and implement (carry out R & D) automation and control systems for enterprises of different economic sectors;
PC 5	Know the basic methods and algorithms for processing the results of the experiment automation solutions;
PC 6	Know the methods based on the use of computer technology: experimental design, multivariate statistical analysis for solving urgent problems of automation and control;
PC 7	To be able to develop systems of automation and control engineering systems;
PC 8	Theoretical Foundations, principles and mathematical methods of construction of systems of automatic control;
PC 9	The acquisition of practical skills in the design of facilities management;
PC 10	Fluency in computer-aided design of automation systems for solving urgent problems in control systems;
PC 11	Knowledge of basic approaches to solving extreme problems in the control systems and the ability to use them;
PC 12	Ability to solve extreme problems arising from the creation of management information systems;
PC 13	Ability to develop intelligent process control systems and intelligent control systems based on neural networks;
PC 14	To possess the theoretical foundations, principles and mathematical methods of construction of digital systems;
PC 15	Possession of theoretical foundations, principles and mathematical methods for constructing pulse systems;
PC 16	The ability to perform computational research work on the design and operation of control systems based on modern computer technology;
PC 17	To be able to put the problems of the analysis and optimization of the structure of systems; be skilled in advanced programming; design a microprocessor module, system memory interface displays job;
PC 18	To know how a computer-integrated manufacturing of new generation;
PC 19	Know modern methods of research of complex systems using computer technology and information technology;
PC 20	Know the principles of modern organization of databases and database systems;
PC 21	Know the principles of modern organization of databases and database systems;
PC 22	Theoretical possibilities of modern technology of creation ACS;
PC 23	Ability to develop hybrid ACS.
PC 24	The ability to analyze the structure of the enterprise, division of tasks in automation and management of industrial complexes. Ready practical maintenance of automated process control, robotic technological complex technological assignment.
PC 25	Ability - to formulate the goals, objectives, research, choose methods and means of solving problems; - Apply modern theoretical and experimental methods for the development of mathematical models of the objects and systems; - Organize and carry out experimental studies and computer modeling using modern means and methods.
PC 26	Master student must acquire understanding of the professional competence of the teacher of high school to become acquainted with the psychology of cognitive activity of students, to study psychological methods and means to improve the efficiency and quality of education, to apply knowledge of pedagogy and psychology of higher education in practice.

Profile direction:

General unique competencies	
GC 1	The ability of the freely usage of the foreign languages like a possibility of the business communication, source of the new knowledge in the field of robotics and automation of production processes, the willingness to usage a foreign language in their professional activities.
GC 2	The ability to analyze of the management of the work group of performers, a willingness to prepare documentation for the creation and development of quality management system.
GC 3	The ability to take initiative, including in situations of the risk, to assume full responsibility, the willingness to actively communicate with colleagues in the scientific, industrial and social and public spheres.
GC 4	The ability to design automation and control systems for the technical systems, the willingness to solve production problems for the automation of technical systems.
GC 5	The ability to analyze business processes like the objects of automation and robotics, organize and carry out of the experimental studies and computer modeling, using modern tools and techniques, to offer technical solutions for robotics and automation of production processes, readiness for work on implementation, commissioning of industrial automation and robotics of the production processes .
GC 6	The ability to systematically analyze the production process, offering of the technical solutions in the development of the automated and robotic systems for production purposes, evaluate and select the best options for automation and robotics circuit manufacturing processes, commitment to production activities on adjustment and operation of automated and robotic systems for production purposes.
GC 7	The ability to study the stability, determine the quality of the regulatory process, synthesize single-loop system of the automatic control, reasonably choose the most appropriate, in terms of working conditions of the local systems of the automation systems, willingness to impose regulators for industrial process automation control process parameters.
GC 8	The ability to analyze the objects of program management, system of cyclic, position, loop control, and choices of the desired software control law, willingness to use systems management software to the production activities.
GC 9	The ability to analyze the electrical wiring diagrams and automation of the manufacturing processes, the willingness to make installation, commissioning and maintenance of the automation of the manufacturing processes.
GC 10	The ability to analyze of the electrical and wiring diagrams for industrial automation, the willingness to make installation, commissioning and maintenance of the industrial automation systems.
GC 11	The ability to analyze the sensors, circuits inclusion for measuring continuous process, make a choice of sensor type in the automation of production processes, the willingness to make installation and commissioning of sensors for the measurement technology of continuous production.
GC 12	The ability to analyze the principle of the sensor circuits inclusion for measuring discrete processes, make a choice in the type of sensor robotics manufacturing processes, the willingness to make installation and commissioning of sensors for the measurement of discrete manufacturing process.
GC 13	The ability to analyze the possibility of electric, pneumatic and hydraulic actuators, to produce the desired type of drive choice, select the desired control circuit actuators automation systems, willingness to make installation, commissioning and operation of the actuators in the automation of manufacturing processes.
GC 14	The ability to analyze the possibility of electric, pneumatic and hydraulic actuators, to produce the desired type of the drive choice, select the desired control scheme actuator mechanisms, machine tools and machines, the willingness to make installation, commissioning and operation of the actuators in the robotics manufacturing processes.
GC 15	The ability to assess the possibilities of modern microprocessor technology, the readiness to usage the software and hardware to meet the challenges of the robotics discrete manufacturing processes.
GC 16	The ability to assess the possibilities of modern microprocessor technology, the readiness to usage microprocessor control systems to meet the challenges of the automation of the continuous processes.
Professional competencies	
PC 1	The ability to apply of the technical equipment automation of the firm Siemens, designed to meet the challenges of automation of the technological processes, the willingness to make installation, commissioning and operation of means of the automation produced by Siemens.
PC 2	The ability to apply of the technical equipment automation of the company Schneider Electric, is intended to meet the challenges of the robotics technology and operations, the willingness to make installation, commissioning and operation of the technical equipment automation produced by Schneider Electric.
PC 3	The ability to apply of the technical equipment automation of the company Honeywell, designed to meet the challenges of the automation of the technological processes, the willingness to make installation, commissioning and operation of the technical equipment automation

	produced by Honeywell.
PC 4	The ability to apply of the technical equipment automation of the company Festo, designed to meet the challenges of the automation of the technological processes, the willingness to make installation, commissioning and operation of the technical equipment automation produced by Festo.
PC 5	The ability to apply the technical equipment automation of Russian companies, intended for automation solutions and robotics technological processes and operations, the willingness to make installation, commissioning and operation of means of automation produced by Russian companies.
PC 6	The ability to apply the technical equipment automation firm Yokogawa, designed to solve problems of automation and robotics technology processes and operations, the willingness to make installation, commissioning and operation of means of automation manufactured by Yokogawa.
PC 7	The ability to apply modern methods of development of the algorithms and software systems automate production processes using microprocessor systems from Siemens. Willingness to carry out the programming of automation of continuous production processes with the usage of the microprocessor-based systems from Siemens.
PC 8	The ability to apply modern methods of development of the algorithms and software systems, robotics manufacturing processes using microprocessor systems company Schneider Electric. Willingness to carry out the programming of automation of continuous production processes with the usage of the microprocessor-based systems from Schneider Electric.
PC 9	The ability to apply modern methods of development of the algorithms and software systems automate production processes using microprocessor systems company Honeywell. Willingness to carry out the programming of automation of continuous production processes with the usage of microprocessor-based systems from Honeywell.
PC 10	The ability to apply the modern methods of the development of algorithms and software systems automate production processes using microprocessor systems company Festo. Willingness to carry out the programming of automation of the continuous production processes with the usage of microprocessor-based systems from Festo.
PC 11	The ability to apply modern methods of development of algorithms and software systems automate production processes using microprocessor systems of Russian companies. Willingness to carry out the programming of automation of continuous production processes with the use of microprocessor-based systems of the Russian companies.
PC 12	The ability to apply modern methods of development of algorithms and software systems automate production processes using microprocessor systems company Yokogawa. Willingness to carry out the programming of

	automation of continuous production processes with the use of microprocessor-based systems from Yokogawa.
PC 13	The ability to solve problems of supervisory control of production processes, the willingness to use the automated system of operational process control in industrial activity.
PC 14	The ability to solve problems of technological preparation of production, the willingness to use automated technological preparation of production.
PC 15	The ability to analyze metallurgical production technology as the automation object. Ready to put the problem of automation of manufacturing processes for steel making.
PC 16	The ability to analyze the chemical industry as the technology of the automation object. Ready to put the problem of automation of chemical processes.
PC 17	Ability to analyze the production technology of petrochemical products as the automation object. Ready to put the problem of automation of industrial processes of production of petrochemical products.
PC 18	The ability to analyze the production technology of mechanical engineering as an object of robotics. Ready to put the problem of robotics manufacturing processes, production engineering.
PC 19	Ability to analyze the production technology of building materials as an object of robotics. Ready to put the problem of robotics manufacturing processes of manufacture of building materials.
PC 20	Ability to apply the basic methods of automated technological complexes in non-ferrous metallurgy. Willingness to review and develop functional scheme of automated technological complexes in non-ferrous metallurgy.
PC 21	Ability to apply the basic methods of automated technological complexes in the chemical industry. Willingness to review and develop functional scheme of automated technological complexes in the chemical industry.
PC 22	Ability to apply the basic methods of automated technological complexes of production of petrochemical products. Willingness to review and develop functional scheme of automated technological complexes of production of petrochemical products.
PC 23	The ability to apply the basic methods of constructing robotic technological complexes of production of construction materials. Willingness to review and develop functional circuits robotic technological complexes of production of construction materials.
PC 24	The ability to apply the basic methods of constructing robotic technological systems, production engineering. Willingness to review and develop functional schemes robot technological systems of production engineering.
PC 25	The ability to analyze the structure of the enterprise, division of tasks in automation and control of production systems. Ready practical maintenance of automated process control, robotic technological complex technological assignment.
PC 26	Ability:

	- To formulate the goals, objectives, research, choose methods and means of solving problems; - Apply modern theoretical and experimental methods for developing mathematical models of the objects and processes related to professional activities towards training; - Organize and carry out experimental studies and computer modeling using modern means and methods. Readiness: - To apply modern methods of development of the technical, informational and algorithmic support of automation and robotics; - Analyze the results of theoretical and experimental studies, make recommendations for improving the devices and systems; - Publication of the results of research and development, in the form of scientific articles and reports, applications for inventions, design documentation, master's thesis under the requirements of GOST and STF.

The following **curriculum** is presented:

<u>Scientific and pedagogical direction</u>

Speciality: 6M070200 - Automation and Control

Form of study day Duration of study 2 years Academic Degree: Master of Engineering Science

cycle discitis	Discitis code.	Name of disciplines	semester	Number of credits		lectures	laboratory	practice	SRO		Type of control	competence	cathedra
				RK	ECTS				SRSP	SRS			
The module of social and language training (8)													
Compulsory component													
BD 1.1.1	FN5201	History and Philosophy of Science	1	2	3	1		1	2	2	V	MC1	ИКиСГД
BD 1.1.3	P5204	Pedagogy	1	2	3	1		1	2	2	V	MC 3	ИКиСГД
BD 1.1.4	P5303	Psychology	1	2	3	1		1	2	2	V	MC 4	ИКиСГД
BD 1.1.2	IY5202	Foreign Language (prof.)	1	2	3			2	2	2	V	MC 2	Ин.яз.
Experimental Research Module (5)													
Elective courses													
BD 1.2.2.1	ONIID 5206	Organization of research and innovation	1	3	5	2		1	3	3	V	PC 3	АиУ
BD 1.2.2.2	ONIR 5206.1	Organization of НИР и ОКР	1	3	5	2		1	3	3	V	PC 4	АиУ
BD 1.2.3.1	MORE 5208	The mathematical processing of the experimental results	2	2	3	2		1	3	3	V	PC 5	АиУ
BD 1.2.3.2	MPAI 5208.1	Methods of planning and analysis in research	2	2	3	2		1	3	3	V	PC 6	АиУ
General Technical module (12)													
Compulsory component													
PD 2.1.1	ATS 5302	Automation of engineering systems	2	3	5	1	1	1	3	3	V	PC 7	АиУ
Elective courses													
BD 1.2.1.1	DNSA 5205	Diagnostics and reliability of automation systems	1	3	5	2		1	3	3	V	PC 1	АиУ
BD 1.2.1.2	NSUE 5205.1	The reliability of the management system and its elements	1	3	5	2		1	3	3	V	PC 2	АиУ
PD 2.2.1.1	STMSSAU 5301	Modern theories, methods and tools for the creation of automation and control systems	2	2	3	1		1	2	2	V	PC 8	АиУ
PD 2.2.1.2	STS SAU 5301.1	Modern technology of ACS	2	2	3	1		1	2	2	V	PC 22	АиУ
PD 2.2.3.1	OUOA 5304	Optimal control automation objects	2	2	3	2		1	2	2	V	PC 11	АиУ
PD 2.2.3.2	MDO 5304.1	Dynamic Optimization Methods	2	2	3	2		1	2	2	V	PC 12	АиУ
BD 1.2.4.1	MM 5207	Macro- and microeconomics	2	2	3	1		1	2	2	V	MC 5	ЭП

BD 1.2.4.2	IM 5207.1	Innovation management	2	2	3	1		1	2	2	V	мс 6	ЭП
The module of designing (9)													
Elective courses													
PD 2.2.2.1	SAP 5303	Systems of Automated Designing	2	3	5	1	1	1	2	2	V	РС 9	АиУ
PD 2.2.2.2	KPSA 5303.1	Computer systems design automation	2	3	5	1	1	1	2	2	V	РС 10	АиУ
PD 2.2.6.1	PSA 5307	Automation systems design	3	3	5	2		1	3	3	V	РС 16	АиУ
PD 2.2.6.2	RSKU 5307.1	Distributed control and management system "Ekspirion"	3	3	5	2		1	3	3	V	РС 17	АиУ
PD 2.2.8.1	STSB HD530 9	Modern technology of creation base and data warehouse	3	3	5	2	1		3	3	V	РС 20	АиУ
PD 2.2.8.2	PD 5309.1	Database Design	3	3	5	2	1		3	3	V	РС 21	АиУ
The module theoretical foundations of control (8)													
Elective courses													
PD 2.2.4.1	ISU 5305	Intelligent Control Systems	3	2	3	1	1		2	2	V	РС 13	АиУ
PD 2.2.4.2	GSU 5305.1	Fuzzy control systems	3	2	3	1	1		2	2	V	РС 23	АиУ
PD 2.2.7.1	ITAU 5308	Integrated automation technology and management	3	3	5	2		1	3	3	V	РС 18	АиУ
PD 2.2.7.2	MISS 5308.1	Methods for studying complex systems	3	3	5	2		1	3	3	V	РС 19	АиУ
PD 2.2.5.1	SSU 5306	Digital control systems	3	3	5	1		1	3	3	V	РС 14	АиУ
PD 2.2.5.2	ISU 5306.1	Switching control systems	3	3	5	1		1	3	3	V	РС 15	АиУ
Scientific and Research module (7)													
Compulsory component													
DTT	NI RM	The Scientific research work of undergraduates	1	1	4							РС 25	АиУ
DTT	NI RM	The Scientific research work of undergraduates	2	1	4							РС 25	АиУ
DTT	NI RM	The Scientific research work of undergraduates	3	1	4							РС 25	АиУ
DTT	NI RM	The Scientific research work of undergraduates	4	4	16							РС 25	АиУ
Practice-oriented module (6)													
Compulsory component													
DTT	IP	Research practice	2	3	12							РС 24	АиУ
DTT	PP	Pedagogical practice	3	3	3							РС 26	АиУ
Module final certification (4)													
Compulsory component													
SEC	KE	Comprehensive exam	4	1	4								АиУ
MD	OZ MD	Registration and protection of the master's thesis	4	3	11								АиУ

Profile direction:

Model curriculum
Speciality 6M 070200 - "Automation and Control"

Duration of training - 1,5 years
Academic degree - Master of engineering and technology
in "6M 070 200 - Automation and Control"
http://portal.kazntu.kz/?q=ru/study/department/studyPlans/421/2012/d/48/0

The course	Sem.	Cycle disciitis.		Cipher disciitis.	Discipline	Credit		Lecture	Lab.	Practical	n / rsg r.	CDS		Form of control				The Department
						RK.	ECTS.					With tutor	Without.	Exam	Term paper	Design project	Test	
1	1	DB	1.1.5	MSU 1115	Microprocessor control system	3	5	1	1	1	1/1/1/3	3	3	In				AIU
1	1	DB	1.1.6	LSA 1116	Local automation system	3	5	1	1	1	1/1/1/3	3	3	In	1			AIU
1	1	DB	1.1.7	MNSA1117	Installation and adjustment of systems of automation of production processes	2	3	1	0	1	1/0/1/2	2	2	P				AIU
1	1	AP	2.1.10	TMP 12110	Technology metallurgical processes	2	3	2	0	0	2/0/0/2	2	2	P				MCM
1	1	AP	2.1.5	TINP 1215	Process measurement in continuous production	3	5	1	1	1	1/1/1/3	3	3	In				AIU
1	1	AP	2.2.8	PMSS 1228	Programming of microprocessor systems from Siemens	3	5	1	1	1	1/1/1/3	3	3	In				AIU
1	1	AP	2.2.9	TSS 1229	Technical means of automation from Siemens	3	5	1	1	1	1/1/1/3	3	3	In				AIU
1	2	DB	1.1.1	IY 1111	Foreign language (professional)	2	3	0	0	2	0/0/2/2	2	2	In				Foreign language
1	2	DB	1.1.2	Men1112	Management	1	2	0	0	1	0/0/1/1	1	1	In				Mcps
1	2	DB	1.1.3	Psi 1113	Psychology	2	3	1	0	1	1/0/1/2	2	2	In				IKISGD
1	2	AP	2.2.1	ATS 1221	Automation of engineering systems	3	5	1	1	1	1/1/1/3	3	3	P				AIU
1	2	AP	2.2.11	ATKM 12211	The automated process systems in metallurgy	3	5	1	1	1	1/1/1/3	3	3	P				AIU
1	2	AP	2.2.6	ISAU 1226	Actuators automation systems	3	5	2	0	1	2/0/1/3	3	3	P				AIU
1	2	AP	2.2.7	ARSU 1227	Automated system of operational control of production processes	3	5	1	1	1	1/1/1/3	3	3	P				AIU
1	2	CPU		EIRM	Experimental issled.rabota magician.	4	5	0	0	0	0/0/0/0	0	0	W				AIU
2	1	CPUj			Internship	10					///			W				AIU
2	1	HOOK			Comprehensive Exam	1	4				///							AIU
2	1	DRdp			Appearance and zasch magisters.diss	3	eleven				///							AIU