ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes
Automation and Control
Information Security Systems

Master's Degree Programmes
Automation and Control
Information Security Systems

Provided by
Al-Farabi Kazakh National University

Version: 23.03.2018

Table of Content

A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[1]
5B070200 – Автоматизация и управление (рус) Автоматтандыру және басқару мамандығы (каз)	Bachelor's degree of Automation and Control	ASIIN	-	TC 02/04
6M070200 – Автоматизация и управление (рус) Автоматтандыру және басқару мамандығы (каз)	Master's degree of Automation and Control	ASIIN	-	TC 02/04
5B100200 - Системы информационной безопасности (рус) Ақпараттық қауіпсіздік жүйелері (каз)	Bachelor's degree of Information Security Systems	ASIIN	-	TC 02/04
6M100200 - Системы информационной безопасности (рус) Ақпараттық қауіпсіздік жүйелері (каз)	Master's degree of Information Security Systems	ASIIN	-	TC 02/04
Date of the contract: 26.01.2016 **Submission of the final version of the self-assessment report:** 17.10.2016 **Date of the onsite visit:** 28.-29.11.2016 **at:** Al-Farabi Kazakh National University, Faculty of Mechanics and Mathematics, Department of Information Systems				
Peer panel: Prof. Dr. Dieter Gollmann, Hamburg University of Technology;				

[1] TC: Technical Committee for the following subject areas: TC 02 – Electrical Engineering/Information Technology); TC 04 – Informatics/Computer Science).

Prof. Dr. Harald Loose, Technical University of Applied Sciences Brandenburg; Prof. Dr. Reinhard Möller, Bergische Universität Wuppertal; Tatyana Em, Quality Assurance Engineer: Luka Giorgadze, Student Karaganda State University.	
Representative of the ASIIN headquarter: Dr. Martin Foerster	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of 15.05.2015 ASIIN General Criteria, as of 10.03.2015 Subject-Specific Criteria of Technical Committee 02 – [Electrical Engineering/Information Technology] as of 09.12.2011; 04 – [Informatics] as of 09.12.2011	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[2]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Bachelor's degree of Automation and Control	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS/ 152Kazakh Credits	Fall Semester / December 2015
Master's degree of Automation and Control	M.Sc.	-	7	Full time	-	4 Semester	120 ECTS/ 59 Kazakh Credits	Fall Semester / December 2015
Bachelor's degree of Information Security Systems	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS/ 152 Kazakh Credits	Fall Semester / 2014
Master's degree of Information Security Systems	M.Sc.	-	7	Full time	-	4 Semester	120 ECTS/ 59 Kazakh Credits	Fall Semester / 2014

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

It is the purpose of the programme to provide „(…) society with qualified specialists in mathematical, information, algorithmic and technical support of creation of the automated technological processes and productions and control systems of them, including methodology of design, the formalized description and algorithmization, optimization and modeling of functioning of systems, implementation, maintenance and operation of human-machine control systems."

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

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

It is the purpose of the programme „to provide students with theoretical knowledge and practical skills allowing to master and apply modern knowledge and the scientific principles of research, development and realization of controls in technical systems of monitoring, automation and the information service used in various areas of human activity.

Training the highly qualified specialists capable to solve research, organizational and administrative problems of development and creation of modern software and hardware for research and design, control, technical diagnosing and industrial tests of systems of automatic and automated control and also to have skills of scientific and pedagogical work on training of specialists on control in technical systems.“

For the Bachelor’s degree programme Information Security Systems the institution has presented the following profile in the self-assessment report:

“The program aims to develop core competencies in the fields of computer networks security, application security, and information security management. To fulfil the growing national need of well trained professionals to work in a wide range of roles to protect information systems in all types of organizations, including research and academia. To contribute towards the need of protecting national information infrastructure from all kinds of threats. To play an effective role in international efforts to make the cyberspace safe, secure and reliable for the national and international communities. To provide students the basic knowledge of information security systems to the study of new quantitative relations and spatial forms of the real world in accordance with the requirements of technology and natural science.”

For the Master’s degree programme Automation and Control the institution has presented the following profile in the self-assessment report:

It is the purpose of the programme „to provide students with theoretical knowledge and practical skills allowing to master and apply modern knowledge and the scientific principles of research, development and realization of information security systems in different kind of information systems in various areas of human activity and also to have skills of scientific and pedagogical work on training of specialists on information security systems.”

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Template SSC-based Objectives-Module-Matrix 5B100200 Information security systems, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M100200 Information security systems, Master
- Template SSC-based Objectives-Module-Matrix 5B070200 Automation and control, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M070200 Automation and control, Master
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Diploma Supplements
- Website of the Master programmes Automation and Control and Information Security Systems (accessed 5th January 2017):
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/1074/1#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/1075/1#.

Preliminary assessment and analysis of the peers:

For all study programs under review detailed and fairly conclusive overall objectives and learning outcomes have been defined and, along with that, programme-specific qualification profiles. Most specific and in a short, precise way the learning outcomes have been described in the respective Objectives-Module-Matrices as well as the Diploma Supplements oriented along the Subject-Specific Criteria (SSC) of the Technical Committees for

Electrical Engineering and Information Technology as well as Informatics. It remained unclear to the peers in how far this information is also available to the public and all relevant stakeholders, for example on the Department's website or on the Intranet. Websites could only be identified for the respective Master programmes but the fields designated for the programme descriptions were empty. Hence, the peers highlighted that subject specific objectives and learning outcomes should be made available to all interested stakeholders.

The peers learned that all programmes are being constantly developed in co-operation with industry representatives as well as in response to government requirements. An industry board with representatives of local enterprises regularly convenes and consults about the improvement of the study programmes. In the case of the Information Security Systems the Kazakh government has laid strong emphasis on the establishment of such a programme in order to have national experts being able to develop a Kazakh cryptography. Consequently, and due to the very limited number of students in these programmes, the peers clearly understand that a broad variety of job options will be available to all graduates. Since the number of graduates (if there were any) has been very small up to now a detailed survey of alumni and employers has not yet been done.

As stated above the peers assessed the objectives and learning outcomes laid down in the Self-assessment report (SAR) to be principally plausible and meaningful. Nevertheless, the form of presentation gives reason for criticism: The descriptions included in several documents handed in (Diploma Supplement, SAR, Obejctives-Module-Matrices) are partly very extensive, not well structured and, as a result, confusing and difficult to read. For a clearer understanding and given the incoherence of the different presentations the peers focused on the descriptions offered in the Diploma Supplements. For the programmes in Automation and Control these are largely conforming to the SSC of the Technical Committee for Electrical Engineering and Information Technology. In the Bachelor programme students shall gain basic theoretical knowledge in mathematics, natural sciences and engineering, in order to understand the fundamental principles of control systems creation and principles of the organization and architecture of automated control and management systems. Further they can apply methods of mathematical analysis and modelling, know how to carry out system analysis of technical systems and are enabled to build mathematical models. Graduates should understand how to work with modelling programs for design and research of automated control systems as well as how to count economic efficiency of introduced planning and design decisions at automation of control in various branches of the economy. Referring to the Master programme the peers remarked that a stronger emphasis could be laid on the more profound knowledge and understanding in mathematics as well as electrical engineering and information technology since the described learning outcomes only aim for a theoretical basis in the field of automation and control and the most

important scientific results of researches. Similarly the peers missed the emphasis that graduates are able develop new methods and approaches to solving problems independently. This notwithstanding the learning outcomes agree with the SSC insofar as Master graduates shall be able to analyze results of theoretical and experimental studies, to make recommendations about improvement of devices and systems and to prepare scientific publications and demands for inventions. Similarly they are supposed to know how to organize and carry out experiments and computer modelling with application of modern tools and methods, generate new ideas, and thus participate in any stage of the development of marketable products for the global market.

Referring to the study programmes of Information Security Systems the peers accepted that Bachelor graduates shall possess basic theoretical knowledge of modern computer and telecommunication tools and practical skills with PC application packages. They should be able to apply algorithmic languages and use standard software to the solution of applied tasks; also they have the ability to analyze a system, identify and define the security risks and requirements for secure operation, as well as to design, implement and evaluate a computer-based system. Apart from these basic abilities the description of the learning outcomes of the Bachelor programme are far more extensive than for all other programmes under review, covering more than two pages of the Diploma Supplement alone. Comparing these descriptions with the respective learning outcomes of the Master programme the peers criticized that the Master includes skills abilities which should better form part of a Bachelor programmes but that at the same time the Master programme lacks Master-specific characteristics. As with the Master in Automation and Control the learning outcomes only target basic general knowledge in the respective disciplines instead of an advanced, profound knowledge surpassing the Bachelor level. According to the described learning outcomes graduates will not possess comprehensive and detailed knowledge in a specialist field of computer science; just knowing about current problems of Information Security and Safety Systems or the capacity to apply the theoretical knowledge received in the fundamental fields of Information Security Systems to solve theoretical, scientific practical and information search-related tasks was deemed by the peers to be hardly coinciding with the requirements of EQF level 7. The peers learned during the on-site-visit that for the past years the Bachelor programme has not had any students mainly due to a lack of government-provided scholarships; consequently, all Master students entering the programme come from different subjects. In the eyes of the peers this partly explained the necessity to emphasize Bachelor goals at Master level. Nevertheless, they considered it important that the learning outcomes as basis for the curriculum must correspond to the EQF level reflected in the Subject-Specific Criteria and that a clear distinction between Bachelor and Master level has to be recognizable from the descriptions.

In sum, the peers see a need to describe the objectives and learning outcomes of the degree programmes in a more brief and concise way that allows for a clear distinction between Bachelor and Master level. The program objectives and learning outcomes should be presented in a coherent form on the website as well as in the Diploma Supplement to make them accessible to all stakeholders.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems

Preliminary assessment and analysis of the peers:
The panel considered the names of the study programmes as absolutely adequate reflecting the respective aims and learning outcomes.

The peers confirmed that all degree programme titles reflect the intended aims and learning outcomes. They learned that due to the fact that both Kazakh and Russian are recognized as official languages in Kazakhstan students must be provided with the possibility to study in either language. Further the appreciated that apart from this bi-lingual offer KazNU is eager to simultaneously offer all study programmes in English.

Criterion 1.3 Curriculum

Evidence:

- Template SSC-based Objectives-Module-Matrix 5B100200 Information security systems, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M100200 Information security systems, Master
- Template SSC-based Objectives-Module-Matrix 5B070200 Automation and control, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M070200 Automation and control, Master
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Module Handbook 5B070200 Automation and control, Bachelor

- Module Handbook 6M070200 Automation and control, Master
- Module Handbook 5B100200 Information security systems, Bachelor
- Module Handbook 6M100200 Information security systems, Master

Preliminary assessment and analysis of the peers:
The peers learned that the content of educational programmes in Kazakhstan is to some extend prescribed by the Standards for Bachelor and Master programmes (GOSO) and other regulations issued by the Ministry of Education and Science, which altogether build a normative framework for designing programmes at the universities in Kazakhstan. In this respect the remaining scope of action of the HEI can only partly be estimated and quantified. Nevertheless, the HEI states that since 2010 through its status of an "autonomous university" it has acquired the right to develop experimental educational programmes which can deviate from the GOSO.

The Bachelor curriculum structure follows for all programmes the same general design. It contains around 45 courses being divided into the state compulsory modules (four courses comprising History of Kazakhstan, Russian and Kazakh language, foreign language and philosophy). The second part is the social communicative module with courses ranging from "psychology" and "culture and religion" to "economics", followed by the STEM (Science, Technology, Engineering and Mathematics) professional module including basic introductions such as "Mathematics I+II" and "Physics I+II". In continuation students pass on to the core professional modules and the individual major track. There are also interdisciplinary modules available covering aspects such as "project management", "accounting" or "intellectually property law". Internships are generally divided into three variants, pedagogic, industrial and thesis research internships usually as part of an industrial internship. For each of the Bachelor programmes under review students have to pass one educational practice during the first study year and three industrial internships during the second, third and fourth study year. Although the peers appreciated very much the strong co-operation with industry and the good organization of the internships, they wondered if a share of roughly 10% of the curriculum in internships was sufficient to gain practical experience. The point was discussed with industry representatives, co-ordinators and teaching staff. While the industry representatives declared that more time spent in the enterprises would certainly be welcome they also understood the necessity to develop the students' theoretical competences. Evaluating the practical share of the faculty-based courses the peers came to the conclusion that students are generally sufficiently provided with practical experiences and an increase of the time spent in internships is not necessarily required. The eighth semester in both Bachelor programmes is entirely reserved for internships and thesis research as well as the writing and defending of the thesis.

In the Bachelor programme Information Security Systems students choose their individual track between “Analysis and development of cryptographic systems” and “Architecture and design security” after completing courses in “Algebra and Fundamental Mathematics”, “Cryptographic and Information Security”, “Programming and Information Systems” and “Network Security and Web-Programming”. The peers agreed that the courses offered in the curriculum convey an adequate basic knowledge and understanding of the discipline (mainly represented in the modules STEM, Fundamental Mathematic and Information Theory), competences in Security Analysis (chiefly represented in “Cryptology”, “Cryptography and Cryptanalysis”, “Security monitoring and analysis” and “Cybersecurity”), Security Design (“Introduction to Information Security”), Investigations and Assessment (“Algorithms and data structures”, “Basics of programming”), Security Management (“Cryptography And Protocols”, “Security systems and management” and “Security Management and Programming”) and Security Practice and Development (“Network and database theory”) in accordance with the requirements of the SSC. Nevertheless, since the study programme has not had any students during the past years much of this content has to be repeated during the Master programme for students coming from different subjects and universities (see below).

In the Bachelor programme Automation and Control students have to pass a greater number of compulsory professional modules in addition to the STEM module before they chose between the two tracks “Real-Time and Embedded Systems” and “Control Engineering and Robotics”. The peers understood that students will gain a basic knowledge and understanding of the discipline and related subjects in the corresponding modules “Theoretical Foundations of Electrical Engineering”, “Linear and nonlinear systems of automatic control”, “Higher Mathematics”, “Physics”, “Theory of languages and automata” and “Theoretical Informatics”. Aspects of Engineering Analysis and Design are then imparted in the modules “Algorithmization and programming”, “Programming Languages and Technology”, “Information Technologies for professional purposes”, “Artificially intelligence techniques in control”, “Software simulation systems”, “Object-Oriented programming” and “Modelling and control of complex systems”. Eventually students are being acquainted with the Engineering Practice and aspects of Product Development mainly in the modules “Automation devices and systems”, “Automation of control and production” and “Optimal control of technological processes”. Hence, the peers were convinced that this curriculum includes satisfactorily the intended learning outcomes of the faculty and is in line with the SSC defined by ASIIN.

At KazNU the Master programmes generally follow a structure of three columns, State Compulsory, Compulsory Professional and Elective Professional Modules. The State Compulsory Module contains again courses on History and foreign languages. In the Master

programme of Automation and Control students have to pass a compulsory professional module in “Industrial Automation and Control” before continuing to elect between two study tracks “Automated Control Systems of Technological Processes” and “Design and development of the advanced industrial information systems” each consisting of four modules. As explained under criterion 1.1 the peers were of the opinion, that the described learning outcomes presented by the HEI on this programme was not totally consistent with the EQF level 7 and the ASIIN SSC, lacking an emphasis on advanced in-depth knowledge, specialized competences and individual work responsibility. Nonetheless, the curriculum examined by the peers assured them that such competences are well included although not sufficiently described. Analysis and Design Competences are being adequately conveyed on Master level in the modules “Optimal management of objects”, “Simulation of Systems”, “Safety and security of computer systems”, “Industrial computers”, “Industrial networks and protocols” and “Automated management systems on microcontrollers”. Equally aspects of Investigation and Assessment are also being dealt with in the corresponding modules of “Industrial networks and protocols”, and “Controllers and Simulators for technological process control” while Practice and Development in the field are represented in modules such as “Mobile and cloud computing platforms” or “Methods and technical equipment of providing safety”. Thus, it was accepted by the peers that students will have complied through this curriculum with the required learning outcomes as well as the SSC.

Most controversially discussed was the Master programme in Information Security Systems. As has been noted before the peers learned that due to the lack of Bachelor graduates from this very study programme the university has to take in graduates from a variety of other programmes and hence sees the necessity to include a great number of Bachelor content into the programme. That this should not lead to a mitigation of the described learning outcomes has already been addressed under criterion 1.1. Nevertheless, the curriculum and the descriptions of the course contents made the peers belief that the general content transmitted during the Master programme is in compliance with EQF level 7 although for internationally comparable, outstanding performances the number of Bachelor courses and contents should definitely be reduced in the future. In the discussion with the programme co-ordinators the peers learned that the HEI is fully aware of the difficulties but that it has to deal with the students admitted until there are some in-house graduates of the Bachelor programme. The peers understood that at the moment and without a valid accreditation the Ministry does not offer scholarships for the Bachelor programme which hopefully will change after the accreditation. The co-ordinators assured that once Bachelor graduates of Information Security Systems enter the Master programme the Bachelor con-

tent will be continuously reduced. Nonetheless, the peers recommended thinking of alternative strategies to ensure that subject-external students gain sufficient basic knowledge in Informatics and Mathematics without over-burdening the Master curriculum. In practice students have to pass the compulsory professional modules “Methods and Tools of Computer Information Safety” and “Mobile and Cloud Computer Platforms, Security and Network Safety”. In continuation they elect between the two tracks of “Theory of information security” and “Information security audit” of each four modules. Corresponding to the SSC students gain Formal, Algorithmic and Mathematic Competences (“Methods and tools of computer information safety”, “Safety of Software and OS”, “Information systems of security and safety”), Analysis, Design and Implementation Competences (“Cryptoanalysis and network security”, “Complex systems of security and cryptographic algorithms”), Technological Competences (“Audit and Attestation of information security”, “Safety of information and telecommunication systems and informative security”, “Information and operating systems security”) and Methodological Competences (“Mobile and cloudy computer platforms, security and network safety”, “Firewalls and network security”) According to the course descriptions many of these modules cover Bachelor as well as Master level aspects and leave, according to the peers, little room for in-depth analysis and individual specialization. Consequently, it was strongly recommended to reduce the Bachelor contents thereby creating more space for the development of special competences adequate to EQF level 7. A further general aspect remarked by the peers concerning the Bachelor as well as the Master programme of Information Security Systems was the under-representation of aspects of “Web Security”. Although the peers accepted that it is usually integrated into a variety of courses and modules they considered it necessary to strengthen this field in both programmes.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Admission regulations in English language on the University website (accessed 06.12.2016): http://kaznu.kz/content/files/pages/folder486/student%20admission%20model%20rules.pdf

Preliminary assessment and analysis of the peers:

Information on the admission regulations for all study programmes were presented in the SAR, additional documentation is also published on the University website. The admission procedure for the Bachelor programmes is mostly governed by regulations issued by the Ministry of Education and conducted through a nationwide unified exam after completing a High School or Professional School Diploma. The Unified National Test (UNT) includes the examination of Kazakh and Russian, Mathematics, History of Kazakhstan and one elective subject, depending on the chosen specialty. Depending on national demand the Ministry of Education sets a limited amount of scholarships for each Bachelor programme offered to those with the highest score. Those applicants above the required minimum score at KazNU of 70 but without a state scholarship have to pay themselves for their study fees. Since no scholarships have been awarded until now by the Ministry for the Bachelor in Information Security Systems this partly explains the lack of students. Only after a successful accreditation the Ministry is ready to offer some scholarships and possibly attract students to the programme.

Admission to the Master programmes is carried out in a similar way. Applicants have to pass a national exam covering a second language (English, German or French) and a specialized exam in their respective discipline. National scholarships set for each subject are offered to those with the best results. In addition KazNU requires for admission to both Master's programmes a Bachelor degree in Automation and Control, Information Security Systems, Mathematics, Information Sciences, Mechanics, Information Systems, Computational Equipment and Software or Mathematical and Computer Modeling. Given that there are until now no Bachelor students of Information Security Systems the study programme will have to rely in the medium-term on graduates of other disciplines. Hence, the inclusion of Bachelor-level courses and contents in the Master's programme will have to remain a necessity if knowledge requirements (especially in Mathematics and Informatics) are not outsourced to the individual accomplishment of the students or made a precondition to the admission to the programme (see criterion 1.3). Such a solution requiring of all applicants a certain proven amount of credits in the respective Bachelor competence would be very welcome by the peers.

With the exception of the special admission issue in the Master programme of Information Security Systems the audit team considered the admission standards and procedures to be beneficial for the achievement of the intended learning outcomes. The peers got the impression that the students are informed about the terms and conditions upon which they can apply for a study programme at KazNU. Moreover, the auditors see that the legal framework is well defined and easily accessible for all relevant stakeholders on the university's website.

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

The peers acknowledge that the HEI has in the meantime started to present all programme descriptions and learning outcomes in English on the faculty website, thus ensuring that they are available to all interested stakeholders. Hence, they see this aspect as fulfilled. Further they appreciate that the described learning outcomes of the Master programme Automation and Control have been refined in order to highlight the more profound knowledge and understanding which is gained in comparison to the Bachelor level. Regarding the criticized learning descriptions of the Bachelor and Master programmes Information Security Systems the peers agree that some improvement has been made in order to secure a clear distinction of the Bachelor and Master level. However, they are still of the opinion that the described learning outcomes of the Bachelor programme are too extensive in comparison to the Master programme and that for the Master programme a clearer description of the advanced knowledge level should be recognizable in the description. The peers further understand that some effort has been made to present the described learning outcomes in a coherent and precise way. Nevertheless, they gather that the presentation in the Diploma Supplements is still much more detailed than the one on the website. For reasons of transparency and easy accessibility the peers emphasize that these presentations should be made still more congruent.

Regarding the aspect of web security the peers affirm that a new course “web security” has been introduced into the Bachelor Information Security Systems curriculum as well as the course “web application security” that is now part of the Master programme. Consequently, the peers consider this aspect as adequately dealt with. In addition, the HEI presented a supervised curriculum of the Bachelor and especially the Master programme of Information Security Systems in order to comply with the peers’ recommendation to reduce the number of Bachelor-level courses. The peers understand that the new curriculum is much more adequate to the demands of EQF level 7 but remark that the presentation on the website is not as concise as the one presented to them in the additional documents. Thus, they recommend presenting the study plan to all stakeholders on the website in the same, concise way.

In conclusion, the peers deem this criterion as partly fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Template SSC-based Objectives-Module-Matrix 5B100200 Information security systems, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M100200 Information security systems, Master
- Template SSC-based Objectives-Module-Matrix 5B070200 Automation and control, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M070200 Automation and control, Master
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Module Handbook 5B070200 Automation and control, Bachelor
- Module Handbook 6M070200 Automation and control, Master
- Module Handbook 5B100200 Information security systems, Bachelor
- Module Handbook 6M100200 Information security systems, Master
- „Information about the mobility of scientific training per 2014-16“ for all study programmes respective has been presented during the on-site visit
- Audit discussions

Preliminary assessment and analysis of the peers:

All study programmes under review are divided into modules which comprise a sum of teaching and learning. The panel found the structure of the modules in general to be adequate and manageable for all stakeholders.

For all programmes the peers learned that a great variety of elective study options is offered in addition to the basic compulsory courses defined by the Ministry. The peers got the impression that the study programmes' electives are being constructed in a very individual and flexible way, leaving sufficient space for the enhancement of each student's particular interest. Furthermore, the programmes are being constantly revised in cooperation with an industry board in order to improve the existing offer or to introduce new electives in the case of changing demands from the part of the future employers (see criterion 1.1). In general, the peers were convinced, that the programme structures allow for an individual yet goal-oriented order of study in the designated time.

Internships form part of each of the programmes under review in an appropriate way although the peers expressed that the percentage of more or less 10% of the curricula could be expanded (see criterion 1.3). For the internships a system of joint supervision has been introduced. Students are partly supervised by a member of the faculty's teaching staff and partly by a representative of the company. All responsibilities are clearly defined in a signed agreement between the partaking stakeholders at the beginning of the internship.

Working practice in form of laboratory work is part of many modules in all programmes and cooperation with industrial partners in the development of assignments and theses allows for a vivid experience of practical work issues. Conclusively and based on the analysis of the curricula and the module descriptions, the peers confirmed that the module objectives and the respective content help to reach both the qualification level and the overall intended learning outcomes of the respective programmes.

International mobility is of huge importance to KazNU given its interest in greater international visibility. Students of all study programmes under review are strongly recommended to spend at least four months at an international university but no official mobility window has been outlined in the curriculum. The peers understood that concerning international mobility the faculties follow a very individual approach trying to identify with each student interested the best options for an exchange. Despite these efforts it appeared that this is not often made use of. Only two students of the Automation and Control programme have spent a full semester at Lublin University of Technology, and few of the Master students have spent a semester at St. Petersburg National Research University.

Apart from full-semester exchanges, all students have the opportunity to partake in a full-sponsored two-week summer exchange at foreign universities. The peers learned that many students have already partaken in this programme that allows for first contacts with international mobility. However, given the HEIs great ambitions a stay of two weeks cannot adequately convey much international experience, although the peers were convinced that a great variety of offers to go abroad does already exist at KazNU. Any department has a vice-dean for international co-operations as well as every chair, there is also a website where all information is available and students may consult with the student office on questions of international mobility. Nevertheless, during their discussion with the students the peers got the impression that some are being restrained especially by the great amount of different programmes and that they lack an adequate overview over options, financial support, etc. Therefore it might be recommendable to further bundle the information about mobility programmes and to enhance their visibility bringing them in closer contact with the students.

Competences and Achievements acquired at other universities are generally acknowledged through the office registrar. With outgoing students and the receiving institution a learning agreement is signed before they leave in order to avoid difficulties with the acknowledgement after the return. If courses at foreign universities do not explicitly match the Kazakh curricula the programme coordinators emphasized that individual solutions are usually found with the respective student. However, the peers ask the HEI to provide them with legally binding recognition regulations of qualifications gained at other universities.

Criterion 2.2 Work load and credits

Evidence:

- Module Handbook 5B070200 Automation and control, Bachelor
- Module Handbook 6M070200 Automation and control, Master
- Module Handbook 5B100200 Information security systems, Bachelor
- Module Handbook 6M100200 Information security systems, Master
- ECTS User's guide
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Audit discussions

Preliminary assessment and analysis of the peers:

The calculation of workload and ECTS credits has proven difficult to bring into accordance with the Kazakh calculation system of credit points. Nevertheless, since 2010 Al-Farabi University has started to apply the ECTS calculation of workload, at least for the recognition of student mobility activities. In the SAR the HEI has provided a detailed but nevertheless complicated description of their transmission of Kazakh credit points to ECTS credit points. As far as the peers understand this complication is mainly due to the varying coefficients applied to different forms of work (i.e. theoretical study, practical and laboratory work, etc.). This results in a diverging designation of credits and total workload for some of the courses. Hence, for example a pedagogic internship is valued at 1 ECTS per 20 hours of workload while the preparation of the thesis is calculated at 30 hours per ECTS credit point.

However, the peers got the impression that in the amount of presented documents a coherent presentation of the calculation was lacking and that the number of credits awarded by each module differed significantly. For example the module for the Bachelor thesis in

Automation and Control is awarded 12 ECTS in the SAR while according to the module handbook it is only awarded 10. The peers insisted that these incongruities must be avoided in order to fully comply with the ECTS System.

Notwithstanding, the peers got the impression, that for the Bachelor and Master programmes the estimated time budgets are more or less realistic. Workload (however it may be calculated) is given at more or less 30 ECTS per semester for all study programmes and in the discussion with the students they appeared to be sufficiently content with the workload required. In sum, the auditors see no evidence for serious structural problems.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Module Handbook 5B070200 Automation and control, Bachelor
- Module Handbook 6M070200 Automation and control, Master
- Module Handbook 5B100200 Information security systems, Bachelor
- Module Handbook 6M100200 Information security systems, Master
- Audit discussions

Preliminary assessment and analysis of the peers:
The peers learned out of the SAR that in general the methodical work is carried out by each teacher according to the individual plan but is coordinated and supervised by the head of the department and the Methodical Bureau. However, due to the more or less strict guidelines to the syllabi of many of the compulsory courses set by the Ministry of Education of Kazakhstan the individual character of course syllabi is limited.

The module descriptions indicate clearly what parts of the contact hours are performed in which way, distinguishing for each course between classroom hours, tutorials and work in groups/practical work. Additionally time for self-study and the assessments is clearly indicated.

Lectures are methodologically dominated by direct instruction through the teacher who further explains the recommended readings but also opens class discussions. In the tutorials and group works a variety of practical problem-solving activities are employed. Additional handouts and material are offered to the students on the course website. Discussions

and presentations are used to enhance the students' abilities in team work and their presentation skills.

The teaching methodology varies between Bachelor and Master level. The peers understood that at Bachelor level most of the courses during the first years consist of chiefly theoretical knowledge while the number of practical classes increases as the study programme advances. At Master level individual scientific research is further promoted and students are encouraged to get actively involved in challenging assignments to find concrete solutions. Therefore they receive tasks and materials for the respective disciplines to organise and realise their work independently. This increasingly independent work is often conducted in collaboration with local research institutes where students of Bachelor, Master and PhD level work jointly on projects according to their knowledge level supervised by professional experts. The peers expressly appreciated this hands-on learning approach, even more so as the laboratories available at KazNU were deemed in order mostly for the basic instruction at Bachelor level but lacked the equipment for advanced learning on EQF level 7 or 8 (see criterion 4.3).

Apart from the practical parts of the courses students of all study programmes are also prepared for work through a variety of compulsory industrial as well as educational internships. Internships are developed in an exemplary way by cooperation with local and national industry partners who affirmed during the discussion with peers that they are regularly involved in the construction of the study programmes. The peers were confirmed in their assessment that the programmes under review are very outcome oriented towards the need of Kazakh employers. For the internships a contract is signed between the department, the industry partner and the student to ensure the legal status of the stakeholders and the results of the internships are equally controlled by a University and an enterprise supervisor.

During the on-site visit the peers also learned that an assessment of the methodical work of the teachers is regularly conducted as part of the course surveys. Good results may lead to an increased salary or the award of scholarships for international mobility etc. The auditors agreed that such measures are a helpful incentive for the improvement of the teaching methodology.

Regarding the teaching language the peers learned that students can principally choose between three study groups, Kazakh, Russian, and English. Following the demand of the students, courses have to be offered in each of the respective languages, however, the peers do not see how often this happens in practice. Through this offer KazNU wants to ensure the improvement of the students' level in English due to the overall policy for an enhancement of the university's internationality. Basic language competences are tested

in the national entry exams, teachers also have to take a TOEFL-Test for which they are trained in special courses (see criterion 4.2). Although the peers very much appreciate this policy, communication with students and teachers raised doubts whether the English level is sufficient to follow or teach classes in this language. Against this background the peers underlined that it would be advisable to spend more efforts in promoting the students' English language skills since the Bachelor programmes only include one "Professionally-Oriented Foreign Language course" valued at 3 ECTS as part of the State Compulsory Module. Even if the requirements of the National Exam can be met at a lower English level the department might consider including more English language courses into the curriculum in order to achieve the ambitious language policy goals of the study programmes. Additionally, it has to be ensured that the English level of the teachers is also continuously developed since the students' English language skills can hardly be improved if their teachers are not fluent at an advanced level.

Despite these aspects the auditors came to the conclusion that the teaching methods and instruments support the students in achieving the learning outcomes, that the programmes are well-balanced between attendance-based learning and self-study and that independent academic research and writing are promoted in all of them.

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Audit discussions

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

and tried to assist the students in all matters. Additionally, students can always approach senior professors, lecturers and other faculty members for advice and assistance what they declared to do regularly and without restraint.

Students receive all necessary information from the university's website. The “Intranet” system located at http://univer.kaznu.kz hosts complete information on the academic process, news, announcements etc. The system is supposed to allow online course registration, examination of course curricula, course schedules, students’ individual curricula and transcripts, access to educational documents and tutorials, as well as review of academic performance. In conclusion, the peers were convinced that students receive all the necessary support and assistance from the part of the HEI.

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

The peers appreciate that the HEI has re-checked all respective documents concerning the criticized inconsistencies of the ECTS calculation and that mistakes have been corrected. Therefore, they see this aspect as fulfilled. Further, it is noted that the HEI has introduced a second course “foreign language for professional purpose” in the fourth semester of the Bachelor programmes in order to enhance the English level of the students. Through this measure six instead of three ECTS credits will be awarded to the improvement of English language skills. Since the peers consider the English level of the teachers of equal importance to that of the students they still keep up their recommendation to increase the efforts of the HEI of improving the staff’s English language skills.

In conclusion, the peers consider this criterion as partly fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Template SSC-based Objectives-Module-Matrix 5B100200 Information security systems, Bachelor
- Template SSC-based Objectives-Module-Matrix 6M100200 Information security systems, Master
- Template SSC-based Objectives-Module-Matrix 5B070200 Automation and control, Bachelor

- Template SSC-based Objectives-Module-Matrix 6M070200 Automation and control, Master
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Module Handbook 5B070200 Automation and control, Bachelor
- Module Handbook 6M070200 Automation and control, Master
- Module Handbook 5B100200 Information security systems, Bachelor
- Module Handbook 6M100200 Information security systems, Master
- Audit discussions

Preliminary assessment and analysis of the peers:
Student learning progresses are regularly documented in all study programmes under review in form of midterm and final exams which can be held in oral or written form as defined by the responsible lecturer. All amounts and forms of assessment are made public beforehand on the intranet available to the students. Further interim control is held in the form of quizzes, tests, presentations, essays, class discussions, roundtables, simulations and other assignments. Each module is assigned 100 points. The maximum number of points a student can collect as a result of two interim controls is 60, or 30 for each interim control. To be allowed to take a final examination, a student must collect not less than 30 points. The maximum number of points a student can get for a final examination is 40. A student's final grade depends on the total number of collected points. At the end of each semester students would usually have six exams. In general, they were content with this amount and the workload attached to the preparation for exams. In order to achieve greater objectivity student examination is divided among three staff members: one who teaches the course, one who attends the examinations and a third who corrects the written tests.

The peers understood that if students fail an exam they have to re-take the course the following year and pay for the repetition under the condition that at least five students out the same course have to repeat, otherwise students have to wait until the course is offered the next time; therefore students do not fall out of the curriculum but the time concept is such that repetitions are usually possible during the same semester in order not to loose time; if students fail for the second time they loose their scholarship and may switch to the privately paid programme. However, once a course is taken the student eventually has to pass it and cannot change it for another course (with the exception of the electives).

At the end of the Bachelor programmes students have to take a final examination on general topics such as History and languages in addition to subject-specific elements. This exam

was constituted by the Ministry of Education. However, the peers learned that this exam is going to be terminated at the end of this academic year.

All study programmes do include a Bachelor or Master thesis. Although the calculations for ECTS credits for the respective theses vary significantly in the different documents presented to the panel, the peers were convinced that the time invested for their preparation is absolutely sufficient (based on several research internships and time for preparation and defense of the theses) in volume and in quality. A certain reservation was being made concerning the Master theses in Information Security Systems. As has been discussed above the integration of a high amount of Bachelor courses necessarily limits the peak quality of the programme although the results were still considered to be generally acceptable. A reduction of Bachelor contents in the future in favour of specialized Master contents will thus lead to an increase in the quality of the Master theses.

In conclusion, the peers agree that the exams are in system, concept and organisation well-devised to individually measure to which extent students have reached the learning outcomes defined.

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

The peers consider the criterion as fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Staff handbooks for all study programmes Self-Assessment-Report
- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Module handbooks for all study programmes
- Presentation of teaching staff on the website (accessed 08.12.2016):
    - http://pps.kaznu.kz/kz/Main/Chair/90

Preliminary assessment and analysis of the peers:
Along with the information in the SAR the HEI presented detailed staff handbooks for all study programmes. On this basis, the peers were convinced that the quantity of the staffing level was sufficient to properly sustain the degree programmes. Regarding the average ratio of students to teachers this is defined by the Law of Education for all HEIs in Kazakhstan. Notwithstanding, the peers raised the concern that the presentation of staff members at KazNU in different documents and on the website is not totally consistent. A coherent display mode would be strongly recommendable. Additionally, information not only on the academic background but also on publications, research specializations and especially the subjects which are taught by the respective persons should be included and made available to all stakeholders.

Regarding the quality of the teaching staff the peers were convinced that the present personnel is adequate for the instruction of the study programmes. The requirements for the qualification of teaching staff are defined in the "Rules for Licensing of Educational Activities, issued by the Government of the Republic of Kazakhstan" according to which the share of teachers with academic degrees (at least PhD) must be at least 70% of the entire number of full-time teachers at all HEIs offering educational programmes on master level. Nevertheless, the peers understand and appreciate that the KazNU is eager to further increase the number of teaching staff with a PhD-degree.

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Audit discussions

Preliminary assessment and analysis of the peers:
The HEI proved that there are offers and support mechanisms available for the teaching staff who wish to further develop their professional and teaching skills. The peers understood that there is a centre of qualification improvement where teachers can also apply for sabbaticals which are generally a possibility. The peers learned from discussion with the staff that there is a special government funding programme for sabbaticals. Once a grant is given substitution of the teaching capacity is guaranteed by the university. An important issue in the development of the staff is the improvement of English language skills. All

teachers have to attend a month of special English training before they pass an English exam as to assure their skills. To further improve the knowledge level in English as also subject-specific the university offers funds to invite foreign experts who give classes and help to improve the language skills. Similarly staff members are offered subsidies to take private English classes. In conclusion, the peers were convinced that a variety of development offers exists and that staff members regularly partake in these offers.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Visitation of the laboratory facilities
- Audit discussions

Preliminary assessment and analysis of the peers:
In general the peers got the impression of a well-equipped learning environment at KazNU during the on-site visit. The library, the student centre and the laboratories offered an excellent space for studying as well as the development of individual enterprises.

Teaching activities at KazNU are financed to a large extend through tuition fees public subsidies depending on the total number of students enrolled in a programme. In turn research activities as well as the laboratory infrastructure is funded and maintained partly project-based and from the overall university budget. The peers approved of the high degree to which local industry and non-university research institutions are involved in the programmes, offering qualified students possibilities for active participation in research projects.

Concerning the equipment available at the faculty the peers got the impression that it was adequate for the transmission of basic knowledge especially in the Bachelor programmes. However, concerning the furtherance of in-depth knowledge and individual research competences which would be required for Master programmes it could still be improved. Much of this lack is being bypassed through the outsourcing of research activities to much better equipped external research institutions. Although the peers appreciated this close co-operation and the general desire to integrate students in active research work they would also recommend not to rely as much on external partners. Instead it should be the aim to continuously further modernize the available laboratory equipment.

Regarding the available literature the university library seems to be well-equipped. Nevertheless, given the growing importance of teaching in English at KazNU and due to the aim of internationalization of the University it seemed important to the panel that the available literature in English should be expanded. In order to completely assess the literature already available the peers also require the presentation of a list of accessible English-speaking journals relevant for the programmes under review.

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

It is understood by the peers that the HEI is willing to improve the online presentation of the teaching staff to enhance its transparency. However, the websites indicated still do not list any of the staff members yet. Hence, the online presentation should be further improved. It is deemed very laudable by the peers that the faculty is making every effort to improve its laboratory equipment in the next years. From the documents presented in addition the peers learn that certain applications for the purchase of new equipment have already been made. Consequently, the peers are certain that the equipment of the laboratories will no longer be an issue during a re-accreditation. Furthermore, from the documents presented by the HEI the peers got an impression of the planned increase of English-speaking literature at the faculty as well as the accessible online journals.

In conclusion, the peers consider the criterion as partly fulfilled.

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Module handbooks for all study programmes are part of the Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- List of mandatory and elective disciplines online (accessed 12.12.2016):
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/1074#
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/1075

Preliminary assessment and analysis of the peers:
Together with the SAR the HEI provided module descriptions for all study programmes. Although these descriptions contain the majority of required information concerning the persons responsible, the description of the course content, a detailed account of the division of work load, credit points, learning outcomes, admission and examination requirements, the forms of assessment and information on the calculation of the module mark, as well as recommended literature the peers did see some room for improvement. Apart from some translation errors causing deviations between module handbook and curriculum the inconsistency of information with respect to the number of ECTS-credits awarded to the respective courses needs to be rectified. Further, the module descriptions contain in some aspects too much information making it nearly impossible to handle them. For example it was not considered necessary to outline the detailed contents of every lesson and a complete list of learning outcomes. Instead, a precise but limited in space description would be absolutely advisable. In addition the identification of the person responsible for a course is not always given. It should be made transparent to the students at least the group of people available to teach the course if a clear pre-identification is not possible. Furthermore, there are courses listed such as "Computer Architecture" in the Bachelor Security Systems programme that do not have any module description at all apart from the name. Also the reading list of each module should be shortened to an adequate amount or it might be indicated one title that will provide the most necessary overview for the course. Finally, the HEI should ensure that the module descriptions are available for all relevant stakeholders online. At the moment at least in the English translation of the website, course lists can only be found for the Master programmes in Automation and Control and Information Security Systems but do not contain any further information. For the Bachelor programmes no websites could be identified at all.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Diploma Supplements presented in the SAR

Preliminary assessment and analysis of the peers:
Diploma Supplements for the Bachelor and Master programmes in Automation and Control as well as Information Security Systems were presented to the peers covering most of the required information. However, details indicating the final mark as well as the relative ECTS grade allowing readers to categorize the individual result are missing. Adjusted Diploma Supplements should be presented to the peers in addition.

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Audit discussions

Preliminary assessment and analysis of the peers:
The peers learned that the determination of overall study conditions as well as large parts of the structure and content of the educational programmes takes place in a generally binding framework provided by the Ministry of Education. Furthermore, the HEI presented in the SAR general provisions for student and staff life at KazNU such as the "Corporate Culture Code", the "Student Code of Honor" and the Curator-Advisor-Provision made between Students and their Advisors. From these documents the peers got the impression that strict regulations for study life at KazNu are well implemented and play an important part in the University life cycle. Provisions regarding admission, study progression and graduation are supposedly published on the University website but are often missing in English translations or website links are not working. The same is valid for the rules and regulations concerning study content, exams or international exchange. The peers came to the conclusion that a general overhaul of the website with respect to English translation, structure and topicality is necessary in order to guarantee that all stakeholders and people from the outside interested in the study programmes have access to the information required. That is especially important considering the internationalization process envisaged by the HEI. Regarding the recognition of qualifications gained at another university the programme coordinators stated that this is generally possible. However, the peers ask that an example of the legally binding recognition regulations shall be provided in the course of the accreditation procedure. Nevertheless, the peers got the impression that for the students all relevant information is available in a transparent way, mostly through the University's Intranet; all documents are accessible online. All in all, the peers concluded that students are well aware about the relevant rules and provisions that govern their course of studies.

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

The peers have checked the revised module handbooks presented by the HEI and conclude, that the situation is much improved. The presentation is still quite extensive but much better readable than the old version. For all modules a person responsible is now indicated

and especially the much shortened reading list is highly appreciated by the peers. Thus, the peers see this aspect as completely fulfilled.

Further, the peers notice that the Diploma Supplements have been revised and do now comprise all the required information including the final grade as well as a relative ECTS grade.

Regarding the accessibility of legal documents, rules and regulations they are now presented in English language as well on a general website of the University guaranteeing an adequate level of transparency. Nevertheless, concerning the legally binding recognition of qualifications gained at other universities the peers agree that these are now referred to in the respective regulations on academic mobility. However, they do not consider it sufficient to simply state that the regulations comply with the principles of the Lisbon convention but that it should be made explicit what these regulations imply.

In conclusion, the peers consider this criterion as partly fulfilled.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report (SAR) for Cluster A, Bachelor and Master Degree in Automation and Control, Bachelor and Master Degree in Information Security Systems
- Audit discussions

Preliminary assessment and analysis of the peers:

From the SAR and the discussions during the on-site visit the auditors gained a satisfying impression of the Quality Management processes active at KazNU. They learned that each semester a survey is implemented in order to evaluate the study courses. Students grade their teachers with 1 to 5 points on 25 categories concerning aspects such as study material, appearance of the teacher, corruption, teaching quality, relevance of content, etc. The results are controlled by the chair and regularly discussed with the respective teachers who always have access to all detailed results of their evaluations. A calculated average total grade is made public on the teacher's website in order to guarantee transparency. If the general grade is below 3 a discussion with the chair is compulsory and improvement measures are agreed on. In this case the students are informed about the consequences of

their survey. However, the participation in the evaluation is voluntary and of the group of students with whom the peers discussed only one had participated in it although they were all well aware of its existence. The peers are of the opinion that it might be advisable to present the survey on social platforms more suitable to the students. In any case the HEI should enhance the transparency to inform the students not only of the average grade of the teacher but of the detailed results of the evaluation.

Apart from the student surveys the HEI aims to improve also the feedback received from employers and alumni. The peers learned that this year a new evaluation of alumni is being implemented for the first time by an external organization. In the employer-board the faculty keeps a close contact to industry representatives involving them in the conceptualization of study programmes and curricula. Hence, before the establishment of the programmes under review an evaluation of employer expectations has been carried out. The peers appreciate this lively exchange.

From the perspective of the students the teaching staff and chair representatives are well accessible. If problems arise they can contact the dean's office at any time and solutions are usually figured out in consideration of student interests. Each study group has also the possibility to contact its curator who will try to establish a problem solution.

In conclusion, the peers were convinced that the QM-measures applied at KazNU are mostly adequate and guarantee an active participation of all stakeholders.

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

The peers take into account that the HEI performs a variety of surveys in order to improve the quality of teaching and learning, including evaluations of study courses as well as industry and alumni. Notwithstanding, the peers still consider it important to involve more students in an active participation and that the students should know the detailed results of the questionnaire and not just the general mark of the course responsible in order to increase the transparency. Consequently, the peers consider this criterion as partly fulfilled.

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. A list of accessible English-speaking journals relevant for the programmes under review
2. A list of industry partners with whom internships in the programmes can be made
3. A matrix of teaching staff, its planned development in the next years and its respective responsibility for courses
4. Legally binding recognition regulations

E Comment of the Higher Education Institution (06.01.2017)

The institution provided an extensive statement as well as additional documents on various topics.

F Summary: Peer recommendations

Taking into account the additional information and the comments given by the Al Farabi National University the peers summarize their analysis and final assessment for the award of the seals as follows:

Degree Programme	**ASIIN-seal**	**Maximum duration of accreditation**
Bachelor's degree of Automation and Control	With requirements	30.09.2022
Master's degree of Automation and Control	With requirements	30.09.2022
Bachelor's degree of Information Security Systems	With requirements	30.09.2022

Degree Programme	ASIIN-seal	Maximum duration of accreditation
Master's degree of Information Security Systems	With requirements	30.09.2022

Requirements for all study programmes

A 1. (ASIIN 1.1) Draft the educational objectives/learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes. A clear distinction between the EQF-level 6 (Bachelor) and 7 (Master) is especially important.

A 2. (ASIIN 1.1) The revised educational objectives/learning outcomes must be presented in a coherent form in all appearance such as the Homepage/Intranet, Diploma Supplement and Self-Assessment Report.

A 3. (ASIIN 5.3) Legally binding regulations for the recognition of qualifications gained at other universities have to be provided.

Requirements for the Master programme Information Security Systems

A 4. (ASIIN 1.4) Re-describe the entry conditions clearly mentioning the prerequisites for students with different Bachelor-degrees if the programme continues to be treated as non-consecutive.

Recommendations for all study programmes

E 1. (ASIIN 4.3) It is recommended to enhance the available laboratory equipment and to keep the computer equipment as well as the licenses up-to-date in order to ensure an adequate background for in-depth knowledge and individual research especially in the Master programmes.

E 2. (ASIIN 5.1) It is recommended to re-model the module descriptions to enhance the readability of module catalogues.

E 3. (ASIIN 6) It is recommended to strengthen the communication of the quality management processes in operation thereby trying to involve more students in an active participation. The students should know the detailed results of the questionnaire and not just the general mark. The feedback loop process should be regularly controlled and summarized in a report accessible to all stakeholders.

E 4. (ASIIN 2.3) It is recommended to further improve the quality of English teaching in the programmes by ensuring that the English level of the teachers is being continuously developed.

G Comment of the Technical Committees (15.03.2017)

Technical Committee 04 - Informatics

The technical Committee discussed the procedure and followed the assessment of the peers without any changes.

The Technical Committee 04 – Informatics recommends the award of the seals subjected to the final assessment of the peers as follows:

Degree Programme	ASIIN-seal	Maximum duration of accreditation
Bachelor's degree of Automation and Control	With requirements	30.09.2022
Master's degree of Automation and Control	With requirements	30.09.2022
Bachelor's degree of Information Security Systems	With requirements	30.09.2022
Master's degree of Information Security Systems	With requirements	30.09.2022

Technical Committee 02 – ET

The Technical Committee generally agrees with the expert panel's assessment, but nevertheless suggests some editorial modifications (see requirements 1, 2 and 4 as well as recommendation 3).

Thus, it suggests replacing the somewhat wide and unspecified term "educational objectives/learning out-comes" by a more qualification-related term ("programme-specific learning outcomes"; requirement 1 and 2).

Regarding the admission of graduates with a very broad and heterogeneous educational or disciplinary background to the Master programme Information Security Systems, the entry conditions need to be revised irrespective of whether the programme is labelled "consecutive" or "non-consecutive". Therefore the Technical Committee recommends skipping the respective part of requirement 4.

In order to clarify the meaning of the recommendation concerning the quality assurance system, the Tech-nical Committee further suggests shortening and modifying the respective recommendation 3.

The Technical Committee 04 – Informatics recommends the award of the seals subjected to the final assessment of the peers as follows:

Degree Programme	**ASIIN-seal**	**Maximum duration of accreditation**
Bachelor's degree of Automation and Control	With requirements	30.09.2022
Master's degree of Automation and Control	With requirements	30.09.2022
Bachelor's degree of Information Security Systems	With requirements	30.09.2022
Master's degree of Information Security Systems	With requirements	30.09.2022

H Decision of the Accreditation Commission (31.03.2017)

Analysis:
The Accreditation Committee discusses the procedure and concludes to follow the recommendation of the peers and the Technical Committees. Some editorial modifications are being introduced for the clarification of several aspects.

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

Degree Programme	ASIIN-seal	Maximum duration of accreditation
Bachelor's degree of Automation and Control	With requirements for one year	30.09.2022
Master's degree of Automation and Control	With requirements for one year	30.09.2022
Bachelor's degree of Information Security Systems	With requirements for one year	30.09.2022
Master's degree of Information Security Systems	With requirements for one year	30.09.2022

Requirements for all study programmes

A 1. (ASIIN 1.1) Re-write the programme-specific learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes. A clear distinction between the EQF-level 6 (Bachelor) and 7 (Master) is especially important.

A 2. (ASIIN 1.1) The revised programme-specific learning outcomes must be presented in a coherent/consistent form in all documents such as the Homepage/Intranet, Diploma Supplement etc.

Requirements for the Master programme Information Security Systems

A 3. (ASIIN 1.4) Re-write the entry conditions clearly mentioning the prerequisites for students with different Bachelor-degrees.

Recommendations for all study programmes

E 1. (ASIIN 4.3) It is recommended to enhance the available laboratory equipment and to keep the computer equipment as well as the licenses up-to-date in order to en-sure an adequate background for in-depth knowledge and individual research especially in the Master programmes.

E 2. (ASIIN 5.1) It is recommended to re-model the module descriptions to enhance the readability of module catalogues.

E 3. (ASIIN 6) It is recommended to strengthen the involvement of all stakeholders within the current quality management processes. The students should know the detailed results of the course evaluation. The feedback loop process should be monitored and the results should be made transparent for all relevant stakeholders.

E 4. (ASIIN 2.3) It is recommended to further improve the quality of English-medium teaching in the programmes by ensuring that the English proficiency of the teachers is being continuously developed.

I Fulfilment of Requirements (23.03.2018)

Analysis of the peers and the Technical Committees 02 (13.03.2018) and 04 (06.03.2018)

For all degree programmes

A 1. (ASIIN 1.1) Re-write the programme-specific learning outcomes so that they describe the academic, subject-specific and professional classification of the qualifications gained in the degree programmes. A clear distinction between the EQF-level 6 (Bachelor) and 7 (Master) is especially important.

Initial Treatment	
Peers	fulfilled Justification: specifically defined learning outcomes have been presented.
TC 02	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.
TC 04	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.

A 2. (ASIIN 1.1) The revised programme-specific learning outcomes must be presented in a coherent/consistent form in all documents such as the Homepage/Intranet, Diploma Supplement etc.

Initial Treatment	
Peers	fulfilled Justification: The learning outcomes were presented in coherent forms on all relevant documents.
TC 02	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.
TC 04	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.

For the Master's programme Information Security Systems

A 3. (ASIIN 1.4) Re-write the entry conditions clearly mentioning the prerequisites for students with different Bachelor-degrees.

Initial Treatment	
Peers	fulfilled Justification: Entry conditions now clearly mention the prerequisites for students with different Bachelor degrees.
TC 02	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.
TC 04	fulfilled Vote: unanimous Justification: The Technical Committee agrees with the assessment of the peers.

Decision of the Accreditation Commission (23.03.2018)

Degree programme	**ASIIN-label**	**Subject-specific label**	**Accreditation until max.**
Bachelor's degree of Automation and Control	All requirements fulfilled	-	30.09.2022
Master's degree of Automation and Control	All requirements fulfilled	-	30.09.2022
Bachelor's degree of Information Security Systems	All requirements fulfilled	-	30.09.2022
Master's degree of Information Security Systems	All requirements fulfilled	-	30.09.2022

Appendix: Programme Learning Outcomes and Curricula

The following **curriculum** is presented:

For the Bachelor programmes Automation and Control:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Core courses										
1	History of Kazakhstan (State Examination) - State Compulsory Module	2	1	0	3	15	2	1			3
2	Kazakh (Russian) Language for Professional Purposes - State Compulsory Module	0	3	0	3	15	0	3			3
3	Higher Mathematics 1 - STEM	2	1	0	3	15	4	1	0		5
4	Physics 1 - STEM	2	1	0	3	15	4	1	0		5
5	Information Technologies for professional purposes - Basic Professional Module 2	2	0	1	3	15	6	0	1		7
6	Algorithmization and programming - Basic Professional Module 5	2	0	1	3	15	6	0	1		7
											30
	2nd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Laboratory	Total	Total in weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Physics 2 - STEM	2	1	0	3	15	4	1	0		5
2	Higher Mathematics 2 - STEM	2	1	0	3	15	4	1	0		5
3	Theoretical Foundations of Electrical Engineering 1- Basic Professional Module 1	2	0	1	3	15	6	0	1		7
4	Languages and technology of programming - Basic Professional Module 5	1	2	1	4	15	3	2	1		6
6	Elements and devices of automation - Basic Professional Module 9	1	2	0	3	15	3	2	0		5
7	Educational practice	40 hours					2				2
											30
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Foreign Language for Professional Purposes - State Compulsory Module	0	2	1	3	15	0	2	1		3

2	Theoretical Foundations of Electrical Engineering 1- Basic Professional Module 1	2	0	1	3	15	6	0	1		7
3	Calculus of variations - Basic Professional Module 3	1	2	0	3	15	3	2	0		5
4	Probability Theory and Mathematical Statistics - Basic Professional Module 3	1	2	0	3	15	3	2	0		5
5	Theory of languages and automata - Basic Professional Module 6	1	2	0	3	15	3	2	0		5
6	Artificially intelligence techniques in control - Basic Professional Module 10	1	1	1	3	15	3	1	1		5
											30
4th											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in hours	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Philosophy of Scientific Knowledge - State Compulsory Module	1	1	0	2	15	1	1			2
2	Electronics - Basic Professional Module 2	1	2	0	3	15	3	2	0		5
3	Optimization Methods - Basic Professional Module 3	1	2	0	3	15	3	2	0		5
4	Operations Research - Basic Professional Module 4	1	1	0	2	15	3	1	0		4
5	Object-Oriented programming - Basic Professional Module 6	1	1	1	3	15	3	1	1		5
6	Optimal control systems - Basic Professional Mod-	2	0	1	3	15	6	0	1		7
7	Industrial Internship	60 hours									2
											30
5th											
a/a	Courses	Teaching		Workload							
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Linear systems of automatic control - STEM	2	1	0	3	15	4	1	0		5
2	Psychology of Interpersonal Communication - Social and Communicative Module or Theoretical and Applied Political Science - Social and Communicative Module or General and Applied Sociology - Social and Communicative Module or Foundations of Law - Social and Communicative Module or Fundamentals of Economics - Social and Communicative Module	1	1	0	2	15	2	1	0		3

3	Ethics of Personal and Social Success - Social and Communicative Module or Culture and Religion - Social and Communicative Module or Ecology and Sustainable Development - Social and Communicative Module or Human Life Safety - Social and Communicative Module	1	1	0		15	2	1	0		3
4	Modeling and identification of objects of control - Basic Professional Module 7	0	2	1	3	15	0	2	1		3
5	Metrology and measurement - Basic Professional Module 7	2	0	1	3	15	6	0	1		7
6	Local automation systems - Basic Professional Module 9	1	0	1	2	15	3	0	1		4
7	Automation of standard processes and production - Basic Professional Module 10	1	1	1	3	15	3	1	1		5
											30
6th											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Labora-tory	Total	Total in weeks	Theory	Practice - Exercises	Labora-tory	Total	ECTS
1	Nonlinear systems of automatic control - STEM	2	1	0			4	1	0		5
2	Software simulation systems - Basic Professional Module 7	1	1	1			3	1	1		5
3	Optimal control of technological processes - Basic Professional Module 8	1	1	1			3	1	1		5
4	Industrial Applications of ICTs (industrial computing technologies) – IET 1 Real-time and Embedded Systems, IET 2 Control Engineering and Robotic	2	0	1			6	0	1		7
5	Innovative Entrepreneurship - Interdisciplinary Module or Intellectual Property Law - Interdisciplinary Module	1	1	0			2	1	0		3
6	Projects Management - Interdisciplinary Module or Accounting and Audit - Interdisciplinary Module or	1	1	0			2	1	0		3
7	Industrial Internship	60 hours					2				2
											30
7th											
a/a	Courses	Teaching		Work-load							
		Theory	Practice - Exer-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Labora-tory	Total	ECTS

1	Scientific writing - IET 1 Real-time and Embedded Systems, IET 2 Control Engineering and Robotic	0	1	0				1			1
2	Information Systems in Industry - IET 1 Real-time and Embedded Systems Applications of Industrial Electronics	2	0	1			6	0	1		7
3	Analysis and Design of Systems in Real Time - IET 1 Real-time and Embedded Systems Advanced Control Techniques	1	2	1			3	2	1		6
4	Embedded Systems Development - IET 1 Real-time and Embedded Systems Robotic Systems	2	0	1			6	0	1		7
5	Neural networks of TP - IET 1 Real-time and Embedded Systems Automatisms in Industrial Security	1	1	1			3	1	1		5
6	Fuzzy Modeling - IET 1 Real-time and Embedded Systems Industrial Communications	1	1	1			3	1	1		5
											31

8th			
a/a	Internships	Allocated hours	ECTS Workload
1	Industry Internship	300 hours	10
2	Pre-diploma Research Internship	210 hours	7
3	Preparation and Presentation of Bachelor's Dissertation (Diploma Project)	360 hours	12
			29

	Overall internship workload		
a/a	Internship	Allocated hours	ECTS Workload
1	Educational Practice - Учебная практика	40 hours	2
2	Industry Internship	420 hours	14
3	Pre-diploma Research Internship	210 hours	7
4	Preparation and Presentation of Bachelor's Dissertation (Diploma Project)	360 hours	12

											205/35
5	Additional type of practice: Sport and Physical training										

For the Bachelor programme Information Security Systems:

1st Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Totalin weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Corecourses										
1	History of Kazakhstan (State Examination) - State Compulsory Module	2	1	0	3	15	2	1			3
2	Kazakh(Russian) Language for Professional Purposes - State Compulsory Module	0	3	0	3	15	0	3			3
3	Foreign Language for Professional Purposes - State Compulsory Module	0	2	1	3	15	0	2	1		3
4	Information and communication technologies - STEM	1	1	1	3	15	2	1	1		4
5	Mathematical analysis I - Basic Professional Module1. Fundamental mathematics	2	2	0	4	15	6	2			8
											21
	2nd Semester										
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exer-	tory	Total	Totalin- weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Physics – BasicProfessional STEM	2	1	0	3		4	1			5
2	Mathematical analysis II - Basic Professional Module 1. Fundamental mathematics	1	3	0	4		3	3			6
3	Computer networks and telecommunications - Basic Professional Module 5. Network and database theory	1	2	1	4		3	2	1		6
4	Programming languages - Basic Professional Module 6. Basics of programming	1	2	1	4		3	2	1		6
5	Educational practice	4					2				2
											25
	3rd Semester										
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exer-	tory	Total	Totalin	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Discrete Mathematics - Basic Professional Module 2. Discrete Mathematics	1	3	0	4		3	3			6
2	Theory of probability and mathematical statistics - Basic Professional Module 3. Information theory	1	2	0	3		3	2			5
3	Computer Architecture - Basic Professional Module 4. Computer Architecture	1	2	0	3		3	2			5
4	Operation systems - Basic Professional Module 4. Computer Architecture	1	1	1	3		3	1	1		5
5	Object-Oriented Programming - Basic Professional Module 6.Basics of programming	1	2	1	4		3	2	1		6

6	Fundamentals of Information Security -Basic Professional Module 8. Introduction to Information Security	1	2	1	4		3	2	1		6
7	Innovative Entrepreneurship(trade-wise) - InterdisciplinaryModule	1	1	0			2	1			3
8	Patentscience - InterdisciplinaryModule	1	1	0			2	1			3
											39
4th Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exer-	Labora-tory	Total	Totalin	Theory	Practice - Exercises	Labora-tory	Total	ECTS
1	Philosophyof Scientific Knowledge - State Compulsory Module	1	1	0	2		1	1			2
2	Microelectronics- STEM	1	1	1	3		1	1	1		3
3	Information theory - Basic Professional Module 3. Information theory	1	2	0	3		3	2			5
4	Algorithms and data structures - Basic Professional Module 7. Algorithms and data structures	1	2	0	3		3	2			5
5	Access Control -Basic Professional Module 8. Introduction to Information Security	1	1	1	3		3	1	1		5
6	Cryptography and Cryptanalysis 1 - Basic Professional Module 9. Cryptology	1	2	1	4		3	2	1		6
7	Computer Forensics - Basic Professional Module 10. Cybersecurity	1	2	0	3		3	2			5
8	Practice Training	60 hours					2				2
											33
5th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Labora-tory	Total	ECTS
1	Numbers theory - Basic Professional Module 2. Discrete Mathematics	1	2	0	3		3	2			5
2	Psychologyof Interpersonal Communication - Social andCommunicative Module or Theoreticaland AppliedPolitical Science - Social andCommunicative Module or General and Applied Sociology - Social andCommunicative Module or Kazakhstan Law - Social andCommunicative Module or Fundamentals of Economics - Social andCommunicative Module	1	1	0	2		3	1			4

3	Ethicsof Personal andSocial Success - Social and-Communicative Module or Culture and Religion - Social andCommunicative Module or Ecology and Sustainable Development - Social andCommunicative Module or Human Life Safety - Social andCommunicative Module	1	1	0	2		3	1			4
4	Database theory -Basic Professional Module 5. Network and database theory	1	1	1	3		3	1	1		5
5	Network security 1 - Basic Professional Module 8. Introduction to Information Security	1	2	1	4		3	2	1		6
6	Cryptography and Cryptanalysis 2 - Basic Professional Module 9. Cryptology	1	2	1	4		3	2	1		6
											30
6th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Labora-tory	Total	ECTS
1	Design and analysis of algorithms - Basic Professional Module 7. Algorithms and data structures	1	2	1	4		3	2	1		6
2	Network security 1 - Basic Professional Module 8. Introduction to Information Security	1	2	1	4		3	2	1		6
3	Information Security Management - Basic Professional Module 10. Cybersecurity	1	2	0	3		3	2			5
4	Cryptanalysis of block ciphers - IET 1Analysis and development of cryptographic systems Secure Operating Systems - IET 2 Security systems and management	1	2	1	4		3	2	1		6
5	Innovative Entrepreneurship - Interdisciplinary Module or Intellectual Property Law - Interdisciplinary Module or Econometrics - Interdisciplinary Module	1	1	0	2		3	1			4
6	Projects Management - Interdisciplinary Module or Accounting and Audit - Interdisciplinary Module or Geoinformatics - Interdisciplinary Module or Latin Language - Interdisciplinary Module	1	1	0	2		3	1			4
7	Practice Training	150 hours					5				5
											36
7th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exer-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Labora-tory	Total	ECTS

1	Cryptographic analysis methods open cryptography - IET 1 Analysis and development of cryptographic systems Information Security Management - IET 2 Security systems and management	1	2	1	4		3	2	1		6
2	Analysis of information systems security - IET 1 Analysis and development of cryptographic systems Wireless Security - IET 2 Security systems and management	1	2	1	4		3	2	1		6
3	Cryptographic protocols - IET 1 Analysis and development of cryptographic systems Security software - IET 2 Security systems and management	1	2	1	4		3	2	1		6
4	Information Security Management - IET 1 Analysis and development of cryptographic systems Security monitoring system - IET 2 Security systems and management	1	2	1	4		3	2	1		6
5	Programming of cryptographic systems- IET 1 Analysis and development of cryptographic systems Analysis of information systems security - IET 2 Security systems and management	1	1	1	3		3	1	1		5
											29

8th Semester			
a/a	Internships	Allocated hours	ECTS Workload
2	Industry Internship	240 hours	8
3	Pre-diploma Research Internship	210 hours	7
	Preparation and Presentation ofBachelor's Dissertation (Diploma Project)	360 hours	12
			27
	Overall internship workload		
a/a	Internship	Allocated hours	ECTS Workload
1	Educational Practice - Учебная практика	60 hours	2
2	Industry Internship	450 hours	15
3	Pre-diploma Research Internship	210 hours	7
4	Preparation and Presentation ofBachelor's Dissertation (Diploma Project)	360 hours	12

											204/36
5	Additional type of practice: Sport and Physical training										

For the Master programme Automation and Control:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Core courses										
1	History and Philosophy of Science - *State Compulsory Module(StateExamination)*	1	1	0	2	15	2	1	0	3	3
2	Foreign language (Professional) - *State Compulsory Module (StateExamination)*	0	2	0	2	15	0	2	0	2	2
3	Organization and Planning of Scientific Research - *Compulsory professional modules 1*	2	1	0	3	15	6	1	0	7	7
4	Automation of technical systems - *Compulsory professional modules 1*	1	2	0	2	15	3	2	0	5	5
5	Industrial computers - *Compulsory professional modules 1*	2	0	1	3	15	6	0	1	5	7
6	Automated management systems on microcontrollers	1	1	1	3	15	3	1	1	5	5
	Research Seminar I	60 hours				2					2
											31
	2nd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Pedagogics - *State Compulsory Module*	1	1	0	2	15	2	1	0	3	3
2	Psychology - *State Compulsory Module*	1	1	0	2	15	2	1	0	3	3
3	Controllers and Simulators for technological process control - *Compulsory professional modules 1*	1	1	1	3	15	3	1	1	5	5
4	Mathematical programming and its application in control systems - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Applied mathematical models of systems, network structure - *Individual Educational Path 2* Design and development of the advanced industrial information systems	1	1	0	2	15	3	1	0	4	4
5	Automation systems design in industrial process - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Automation systems design - *Individual Educational Path 2* Design and development of the advanced industrial information systems	1	1	0	2	15	3	1	0	4	4
6	Theoretical computer science - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Safety and security of computer systems - *Individual Educational Path 2* Design and development of the advanced industrial information systems	1	1	0	2	15	3	1	0	4	4

7	Distributed calculations - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Design of technical systems of security management - *Individual Educational Path 2* Design and development of the advanced industrial information systems	1	1	0	2	15	3	1	0	4	4
	Research Internship 1	60 hours				2					2
	Research Seminar II	60 hours				2					2
											31
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exerci-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Information support of management systems - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Simulation of systems - *Individual Educational Path 2 Design and development of the advanced industrial information systems*	2	1	0	3	15	6	1	0	7	7
2	Optimal control of automation objects - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Mobile and cloud computing platforms - *Individual Educational Path 2 Design and development of the advanced industrial information systems*	2	0	1	3	15	6	0	1	7	7
3	Methods and technical equipments of providing of safety - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Industrial networks and protocols - *Individual Educational Path 2 Design and development of the advanced industrial information systems*	2	0	1	3	15	6	0	1	7	7
4	Administration of corporate networks - *Individual Educational Path 1 Automated Control Systems of Technological Processes* Optimal control of automated objects - *Individual Educational Path 2 Design and development of the advanced industrial information systems*	2	1	0	3	15	6	1	0	5	7
5	Research Seminar 3	60 hours					2				2
											30
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exerci-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	90 hours									3
2	Pedagogic internship	210 hours									7
3	Research Seminar 4	240 hours									8
4	Thesis Writing and Defense	180 hours									6
5	Complex Exam	120 hours									4

											28
	Overall internship workload										
a/a	Courses	Teaching		Work-load							
		Theory	Practice - Exerci-	Labora-tory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	150 hours									5
2	Pedagogic internship	210 hours									7
3	Research Seminars	420 hours									14
4	Thesis Writing and Defense	180 hours									6
5	Complex Exam	120 hours									4
											84/36

For the Master programmes Information Security Systems:

1st Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Totalin weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Corecourses										
1	Pedagogics(in English language) - Compulsary State Modules	1	1	0	2		2	1			3
2	Psychology (in English language) – Compul-sary State Modules	1	1	0	2		2	1			3
3	Organization and planning of scientific research (in English language) – Compulsory Profes-sional Module 1	2	1	0	3		6	1			7
4	Mobile and cloud computer platforms (in Eng-lish language) - Compulsory Professional Mod-ule 2	2	1	0	3		6	1			7
	Network safety (in English language) - Compul-sory Professional Module 2	2	1	0	3		6	1			7
5	Research Seminar I	120 hours				3					3
											30
	2nd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Totalin-weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS

1	History and Philosophy of Science (in English language) – Compulsary State Modules	1	1	0	2		2	1			3
2	Foreign language (Professional) (in English language) - Compulsary State Modules	0	2	0	2		0	2			2
3	Management of information security (in English language) - Compulsory Professional Module 2	2	1	0	3		6	1			7
4	Analitical information systems of security(in English language) - Individual Educational Path 1,Elective module 1 Consulting models of complex estimation of safety of information and telecommunication systems(in English language) - Individual Educational Path 2,Elective module 1	1	1	0	2		3	1			4
5	Cryptographic methods of information safety (in English language) - Individual Educational Path 1, Elective module 1 Management of risk of informative security (in English language)- Individual Educational Path 2,Elective module 1	1	1	0	2		3	1			4
6	Planning of the complex systems of security(in English language) - Individual Educational Path 1,Elective module 2 Management technologies information security(in English language)- Individual Educational Path 2,Elective module 2	1	1	0	2		3	1			4
7	Development and analysis of cryptographic algorithms (in English language) – Individual Educational Path 1,Elective module 2 Security of the operating systems (in English language)- Individual Educational Path 2,Elective module 2	1	1	0	2		3	1			4
8	Research Internship 1	60 hours				2					2
9	ResearchSeminar II	120 hours				3					3
											33
	3rd Semester										
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Safety of SOFTWARE (in English language)- Individual Educational Path 1,Elective module 3 Audit of information security (in English language)- Individual Educational Path 2,Elective module 3	2	1	0	3	6	1				7
2	Safety of OS (in English language)- Individual Educational Path 1,Elective module 3	2	1	0	3	6	1				7

	Attestation of objects of informative safety (in English language)- Individual Educational Path 2,Elective module 3										
3	Cryptoanalysis(in English language)- Individual Educational Path 1,Elective module 4	2	1	0	3	6	1				7
	Fairwalls of networks (in English language)- Individual Educational Path 2,Elective module 4										
4	Analysis of network security (in English language)- Individual Educational Path 1,Elective module 4	2	1	0	3	6	1				7
	Systems of network security (in English language)- Individual Educational Path 2,Elective module 4										
											28
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Totalin	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	120 hours					4				
2	Pedagogic internship	210 hours					7				
3	Research Seminars	270 hours					9				
4	Thesis Writing and Defense	180 hours					6				
5	Complex Exam	120 hours					4				
							30				
	Overall internship workload										
a/a	Courses	Teaching hours		Workload							
		Theory	Practice - Exercises	Laboratory	Total	Totalin	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	150 hours					6				
2	Pedagogic internship	210 hours					7				
3	Research Seminars	450 hours					15				
4	Thesis Writing and Defense	180 hours					6				
5	Complex Exam	120 hours					4				
											83/38