



ASIIN Seal

Accreditation Report

Bachelor's Degree Programme
Information Security Systems
Data Science

Master's Degree Programme
Information Security Systems
IT Management

PhD Programme
Information Security Systems
Artificial Intelligence in Medicine

Provided by
Al-Farabi Kazakh National University

Version: 06 December 2024

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A About the Accreditation Process

Name of the degree programme (in original language)	(Official) English translation of the name	Labels applied for ¹	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC) ²
Системы информационной безопасности	Ba Information Security Systems	ASIIN	ASIIN, 31.03.2017-30.09.2023	04
Системы информационной безопасности	Ma Information Security Systems	ASIIN	ASIIN, 31.03.2017-30.09.2023	04
Системы информационной безопасности	PhD Information Security Systems	ASIIN	ASIIN, 31.03.2017-30.09.2023	04
Наука о данных	Ba Data Science	ASIIN	-/-	04
IT-Менеджмент	Ma IT Management	ASIIN	-/-	04
Искусственный интеллект в медицине	PhD Artificial Intelligence in Medicine	ASIIN	-/-	04
Date of the contract: 12.01.2023 Submission of the final version of the self-assessment report: 10.03.2023 Date of the onsite visit: 25. – 27.04.2023 at: Al-Farabi Kazakh National University, Almaty				
Peer panel: Prof. Dri-Ing. Helena Szczerbicka, Leibniz University Hannover Prof. Dr. Uli Schell, Hochschule Kaiserslautern University of Applied Sciences Saule Amanzholova, Ass. Professor, International University of Information Technologies				

¹ ASIIN Seal for degree programmes

² TC: Technical Committee for the following subject areas: TC 04 - Informatics/Computer Science

A About the Accreditation Process

Amiret Tuyakuly Konysbaev, ALE "Kazakhstan Association of IT companies" Ualikhan Sadyk, student representative from Suleyman Demirel University	
Representative of the ASIIN headquarter: David Witt	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018 ASIIN Additional Criteria for Structured Doctoral Programmes as of March 15, 2021	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Bachelor Data Science	Бакалавр в области информационно-коммуникационных технологий по образовательной программе Наука о данных / Bachelor in Information and Communication Technology in the educational programme Data Science	-/-	6	Full time	-/-	4 years	240 ECTS	Annually, 2021
Master IT Management	Магистр технических наук по образовательной программе IT-Менеджмент / Master of Technical Sciences in the educational program IT-management	-/-	7	Full time	-/-	2 years	120 ECTS	Each semester, 2021
PhD Artificial Intelligence in Medicine	Доктор философии PhD по образовательной программе Искусственный интеллект в медицине / PhD according to the educational program Artificial Intelligence in Medicine	-/-	8	Full time	-/-	3 years	180 ECTS	Each Semester. 2020
Bachelor Information Security Systems	Бакалавр в области информационно-коммуникационных технологий по образовательной программе Системы информационной безопасности / Bachelor in Information-Communication Technologies according to the educational program Information security systems	-/-	6	Full time	-/-	4 years	240 ECTS	Annually, 2014

³ EQF = The European Qualifications Framework for lifelong learning

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF ³	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Master Information Security Systems	Магистр технических наук по образовательной программе Системы информационной безопасности / Master of Engineering Sciences on educational program System information security»	-/-	7	Full time	-/-	2 years	120 ECTS	Each semester, 2014
PhD Information Security Systems	Доктор философии PhD по образовательной программе Системы информационной безопасности / PhD Information security systems	-/-	8	Full time	-/-	3 years	180 ECTS	Each semester, 2014

The Al-Farabi Kazakh National University (KazNU) is the oldest university in the Republic of Kazakhstan and currently the largest of the country. The university is named after the Eastern philosopher Al-Farabi, who originated from this region in the ninth century.

The university is divided into 16 faculties and 68 departments and in addition operates seven scientific research institutes, 29 scientific centres, two shared laboratories and 125 scientific and educational research laboratories. The current number of students is 24,600 of which 19,700 are bachelor students, 3,600 are master students and 1,300 pursue a PhD. KazNU offers 542 educational programs, including joint educational programmes and double degrees.

Since the beginning, a large focus of the university lay on science and research, represented by the main aim of the university “science and innovation”. Bilateral agreements exist between KazNU and 550 universities in 50 countries; therefore the number of international students in total is around 3,000. The university additionally operates branches in Turkey and Kyrgyzstan, and plans to open two intergovernmental institutes in Uzbekistan and Russia.

The six study programmes under review are taught at the Faculty of Informational Technologies. The PhD Artificial Intelligence in Medicine is taught in cooperation with the Faculty of Medicine and Health Sciences. The faculty continuously developed new study programmes to accommodate new achievements in science and demands on the job market.

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

“The purpose of the educational program “6B06301 - Information Security Systems” is to train competitive information security professionals capable of demonstrating advanced knowledge of information technology security, computer and network security, security management, and data security in information systems.”

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

“The purpose of the educational program "7M06301 – Information security systems" is to train highly qualified specialists in the field of information security, with the knowledge and competencies required to work in the field of ICT, the formation of human resources of highly qualified specialists competitive in the domestic and international labor market in accordance with their needs and prospects for the development of the country and the region.”

For the PhD programme Information Security Systems the institution has presented the following profile in the self-assessment report:

“The purpose of the educational program "8D06301– Information security system" is to prepare competitive specialists of the highest qualification in the field of information security and information protection, which have a high level of professional culture, able to formulate and solve modern scientific and practical problems in the field of information security and information protection.”

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

“The aim of the educational program "6B06107- Data Science " is to provide quality training of competitive specialists in the field of science and big data analytics in the rapidly growing field with a huge unmet demand. A unique interdisciplinary educational experience allows students to gain a broad base of knowledge and skills that employers are looking for.”

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

“The purpose of the educational program "7M06113-IT-management" is to train highly qualified specialists in the field of managing the company's information infrastructure, its digital resources, as well as a wide range of information technologies in the field of managing the company's activities in various aspects, including marketing, financial, innovation and other strategies in order to ensure a sustainable competitive advantage in the long term in the conditions of turbulent changes in the business environment. As well as providing highly qualified personnel in the field of transforming the management system of any company into a digital format and integrating the business processes of the enterprise into the virtual space.”

For the PhD programme Artificial Intelligence in Medicine the institution has presented the following profile in the self-assessment report:

“The aim of the “Artificial intelligence in medicine” educational program is to provide high-quality training of highly qualified scientific and scientific-pedagogical personnel for the system of higher and postgraduate education and scientific research in the interdisciplinary field of artificial intelligence and healthcare. The implementation of the educational program is aimed at the formation of a professional personality of a specialist capable of: - systematize and interpret scientific theories, concepts, and current trends in the field of artificial intelligence and healthcare in order to further apply this knowledge in the implementation of scientific research; - make an original contribution to expanding the boundaries of knowledge in the field of healthcare using artificial intelligence technologies; - create

B Characteristics of the Degree Programmes

systems and applications using embedded systems to solve healthcare problems; evaluate and determine the significance of a product of one's own and other scientific activity, represent and defend one's own scientific opinion in a scientific discussion.”

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:

- Self-Assessment Report
- Study plans of the degree programmes
- Module descriptions
- Faculty website

Preliminary assessment and analysis of the peers:

The experts base their assessment of the learning outcomes on the information provided in the module descriptions and in the Self-Assessment Report of all six degree programmes under review. For all programmes, Al-Farabi Kazakh National University (KazNU) has described Intended Learning Outcomes (ILO), which cover a number of specific competences students should acquire in their respective degree programme. The ILO of each degree programme are published on the programme's website.

The experts refer to the Subject-Specific Criteria (SSC) of the Technical Committee Informatics/Computer Science and the module descriptions as a basis for judging whether the intended learning outcomes of the six degree programme as defined by KazNU correspond with the competences as outlined by the SSC.

As described in the Self-Assessment Report, graduates of the Bachelor's degree programme Information Security Systems should be able to

- “LO1. use the provisions of security standards and evaluate their role in protecting data and resources;
- LO2. apply mathematical methods of coding, cryptography and cryptanalysis in data protection problems;
- LO3. apply the basic provisions of normative legal acts in the field of information security;

- LO4. use programming languages and tools to develop secure software and mobile applications;
- LO5. use risk management principles to assess threats, vulnerabilities, counter-measures and impact on risks in information systems;
- LO6. troubleshoot, maintain, and update enterprise-level information security systems;
- LO7. continuously monitor the network and provide real-time security solutions;
- LO8. plan, implement, and perform security audits of operating systems and applications;
- LO9. plan incident response, disaster recovery, and business continuity as part of information security;
- LO10. design components of information security systems;
- LO11. to evaluate the risk management policy information security and applications;
- LO12. to demonstrate knowledge of the basic laws of functioning and development of nature and society, the ability to adequately navigate in various socio-economic, socio-legal, ethical, political and emergency situations.”

As described in the Self-Assessment Report, the Master’s degree programme Information Security Systems is designed to enable the students to

- “LO1. [...] determine the content, methods and means of training in accordance with the objectives of the course for the development of teaching materials and lectures, practical classes to carry out educational activities in professional educational institutions based on psychological and pedagogical principles;
- LO3. describe the regulatory legal acts, international and state standards in the field of information security;
- LO4. choose and reasonably use methods and hardware-software information protection;
- LO4. [...] analyze threats to information security facilities and methods of counter-action;
- LO5. evaluate the cryptographic strength of encryption algorithms;
- LO6. use methods to improve the security of data transmission in telecommunication networks;
- LO7. identify vulnerabilities of cryptographic protocols and transformations, and effectively apply them to solve applied problems;

- LO8. understand the composition and structure of cloud and mobile technologies, the theory of neural networks, mining, and also use the methods of semantic analysis;
- LO9. use analytical and experimental research methods to put forward hypotheses on the topic of scientific research using knowledge in the field of history and philosophy of science, a subject field, speak English as a means of communication in professional and scientific activities;
- LO10. organize debugging and testing of software, hardware, and software information security.”

For the PhD programme Information Security Systems KazNU has presented the following learning outcomes in the self-assessment report:

- LO1. demonstrate a systematic understanding of information security techniques and tools;
- LO2. justify the choice of decision-making methodology to ensure the protection of information;
- LO3. demonstrate knowledge of patent search procedures, protection of intellectual property rights to scientific discoveries and developments;
- LO4. analyze and evaluate, improve processes, develop specifications and design information security systems;
- LO5. classify methods for ensuring and assessing security in information processing systems (operating systems and applications, networks, protocols);
- LO6. to analyze the existing methods and means used for the control and protection of information, and to develop a proposal for their improvement and increase the effectiveness of this protection;
- LO7. identify similarities and differences in methods and systems of protection, security assessment and measures taken to protect information, methodology for creating secure information systems;
- LO8. develop software for innovative projects using the latest technological solutions;
- LO9. evaluate the cryptographic strength of block ciphers, the synthesis of ciphers, encryption systems with public keys, key distribution protocols, identification, organization of confidential communication networks;
- LO10. analyze, evaluate and synthesize new and complex ideas in the field of information security; formulate innovative scientific tasks in the field of design and development of information security systems;

- LO11. to prepare on the basis of the results of the research publications that deserve coverage at the national and international levels, scientific and technical reports, reviews;
- LO12. to substantiate the obtained scientific results in the field of information security in front of the wider scientific.”

As described in the Self-Assessment Report, graduates of the Bachelor’s degree programme Data Science should be able to:

- “LO 1. Analyze the features of social, political, cultural institutions in the context of their role in the modernization of Kazakhstan society, describe the stages of the formation of an independent Kazakhstan statehood in the context of the global and Eurasian historical process.
- LO 2. Apply the methods of mathematical analysis, probability theory, algebra and discrete mathematics, statistical calculations and optimization principles for the correct formulation and solution of data analysis problems.
- LO 2. Configure the operating system, apply network data transfer protocols, mechanisms and methods for protecting computing resources from attacks, determine data sources, adapt a scalable computing infrastructure to solve various classes of data analysis problems.
- LO 3. Define clear requirements for the problem, decompose the problem, use efficient strategies to obtain an algorithmic solution, implement solutions through programming in a suitable high-level language, evaluate and compare different data analysis algorithms.
- LO 5. Establish criteria for selecting an adequate scalable data management technology based on given criteria, tune the database to achieve the best performance, adequately consider security aspects in databases, select and use cloud data service technologies, summarize the basic principles and capabilities of managing virtualized and distributed data.
- LO 6. Analyze data by appropriately fitting, evaluating, visualizing and interpreting various statistical models, using statistical methods, using standard statistical software packages.
- LO 7. Develop and implement components of artificial intelligence systems to improve the speed and quality of data processing and decision making, develop, implement and use various data representations for classification and regression, determine suitable tools and methods for solving the main classes of machine learning problems, including deep learning methods .

- LO 8. Model logical data structures, defining data composition, data structure and sources, ensuring data protection, use the data collection process to ensure the completeness and interconnectedness of data from different sources and to develop solutions for optimizing data storage and processing.
- LO 9. Assess technology opportunities and innovations based on big data, evaluate data scale and application speed at multiple scale levels, apply big data ecosystem methods and tools.
- LO 10. Implement and apply advanced data mining methods with appropriate tools, evaluate and compare the suitability, scalability and performance of various methods in practical conditions, complete the full cycle of data mining, solve practical data mining problems.
- LO 11. Be professionally and ethically responsible in areas such as data citation and ownership, data security and privacy, data analysis privacy implications and concerns.
- LO 12. Possess the necessary and sufficient level of communicative competence for the active use of a foreign language, both in everyday and professional communication, work in a team, tolerantly perceiving social, ethnic and cultural differences, critically evaluate their own activities, the activities of the team.”

As described in the Self-Assessment Report, graduates of the Master’s degree programme IT Management should be able to:

- “LO 1. Conduct a comprehensive analysis of the digital infrastructure of the organization to assess the effectiveness of information resources, conduct a comprehensive audit of the Information Systems, its digital component in order to assess the possibilities of integrating new developments and technical solutions into it.
- LO 2. Predict the effectiveness of innovation in the digital infrastructure of the organization based on a comprehensive statistical analysis of data about the managed object.
- LO 3. Design a comprehensive financial management strategy of the organization and its compatibility with the company's development strategy in order to ensure the company's competitiveness in the long term, interpret and generalize it in accordance with the industry specifics of the managed object.
- LO 4. Assess the implemented technical solutions to improve the efficiency of production business processes and compare them with the cost of their implementation costs.
- LO 5. Depending on the developed financial management strategy, plan a sound policy of working with external agents of the enterprise, such as banks, the public

sector, tax authorities, investment and venture funds, as well as evaluate the possibility of participating in government support programs.

- LO 6. Differentiate and classify methods and tools for identifying, identifying and managing negative scenarios for processes or projects implemented in the company. Predict the size and probability of damage, methods of neutralizing them, and compare them with the cost of reducing or preventing them.
- LO 7. Use data mining methods and tools to gain the knowledge needed to make decisions and improve business processes.
- LO 8. To develop the field of information and communication technologies by conducting theoretical and experimental research, through the integration of knowledge from existing areas of ICT, new or interdisciplinary fields, and taking into account philosophical, historical, linguistic, psychological considerations.
- LO 9. Document the process and the result of scientific research in accordance with the standards and regulations for the maintenance of scientific research documentation, if necessary, using English as a means of communication in professional and scientific activities.
- LO 10. Determine the content, methods and means of training sessions in accordance with the objectives of the course for the development of the educational and methodological complex of the discipline and the implementation of educational activities based on psychological and pedagogical principles.”

For the PhD programme Artificial Intelligence in Medicine KazNU has presented the following learning outcomes in the self-assessment report:

- “LO 1. Build mathematical models of various tasks of creating a public good, determine a methodology for applying artificial intelligence methods to them, set quality assessment criteria, develop general data models and organize data exchange based on cloud computing in order to increase the likelihood of socially beneficial results.
- LO 2. Compare and select digital signal processing algorithms for various medical applications, evaluate experimental results and correlate them with appropriate design and programming methods, implement digital signal processing algorithms and design methods on embedded devices.
- LO 3. Perform the main stages of preparing medical imaging data when developing artificial intelligence algorithms, explain the current limitations for data processing, and explore new approaches to solving data accessibility problems.
- LO 4. Apply machine learning methods for medical diagnostics and analytics based on medical data, create tools for data mining.

- LO 5. Evaluate how embedded systems, artificial intelligence tools for medical care can be used to identify and assess the health effects of behavioral and environmental factors.
- LO 6. Draw up research programs, apply research methods, carry out scientific management of research on the most important scientific problems of a fundamental and applied nature, obtain the necessary data from scientific and technical documents, reports and other reference materials.
- LO 7. Conduct teaching activities in higher education institutions, introduce advanced and innovative teaching technologies, develop educational and methodological support for new courses, taking into account the social modernization of Kazakhstan and the development of the national economy.
- LO 8. To contribute in the framework of original studies that expand the boundaries of knowledge through the use of artificial intelligence in medicine, use the academic style of writing, publish research results in the form of scientific articles in Kazakh and foreign publications, be prepared for correct and tolerant interaction in society, for social interaction and cooperation to solve scientific and technical problems.”

The experts are convinced that the intended qualification profiles of all programmes under review allow graduates to take up an occupation, which corresponds to their qualification. The degree programmes are designed in such a way that they meet the goals set for them. The objectives and intended learning outcomes of all degree programmes under review are reasonable and well founded.

The peers conclude that the objectives and intended learning outcomes of the Bachelor’s degree programme Information Security Systems, the Master’s degree programme Information Security Systems, the PhD programme Information Security Systems, the Bachelor’s degree programme Data Science, the Master’s degree programme IT Management, and the PhD programme Artificial Intelligence in Data Science adequately reflect the intended level of academic qualification (EQF 6 for Ba Information Security Systems and Ba Data Science, EQF 7 for Ma Information Security Systems and Ma IT Management, EQF 8 for PhD Information Security Systems and PhD Artificial Intelligence in Medicine) and correspond sufficiently with the ASIIN Subject-Specific-Criteria (SSC) of the Technical Committee 04 – Informatics/Computer Science.

Criterion 1.2 Name of the degree programme

- Self-assessment report
- KazNU webpage
- Ministry of Education and Science Republic of Kazakhstan, Unified System of Management of Higher Education
- Webpage of each degree programme
- Diploma and diploma supplement
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The titles of the degree programmes follow the rules for naming study programmes set by the Kazakh Ministry of Education.

After reviewing the documents and the on-site discussions, it turns out for the experts that the name of the Master's degree programme IT Management is not entirely coherent with the contents taught and the learning objectives aimed at. For example, the experts are of the opinion that this programme is more of a study programme in the field of business informatics, as there is also a strong focus on business topics. The experts discuss this with the programme managers. They can understand the experts' reasoning and already indicate during the audit that they will reconsider the name of the programme.

Consequently, the experts hold the opinion that the English translation and the original Kazakh name of the two Bachelor's degree programmes, the two PhD programmes and the Master's degree programme Information Security Systems correspond with the intended aims and learning outcomes as well as the main course language. However, the experts conclude that the English translation as well as the original name of the Master's degree programme IT Management do not correspond with the taught contents and intended learning objectives.

Criterion 1.3 Curriculum

Evidence:

- Self-assessment report
- Module descriptions of all study programmes
- Study plan of each study programme
- Learning objectives-module matrices
- Regulation on academic mobility of KazNU of May 23, 2022.
- Discussions during the audit
- Homepages

Preliminary assessment and analysis of the peers:

The six study programmes under review are offered at the Faculty of Informational Technologies. The PhD Artificial Intelligence in Medicine is taught in cooperation with the Faculty of Medicine and Health Sciences. Each semester is equivalent to 15 weeks of learning activities. Besides these learning activities, there is usually one week for midterm exams and two weeks for final exams.

The Bachelor's degree programme Data Science and the Bachelor's degree programme Information Security Systems are both designed for two years with 120 ECTS points and offered as full-time programmes.

The curricula of both Bachelor's degree programmes include General Education Disciplines (GED) with 56 ECTS points (5 Elective), Core Disciplines (CD) with 112 ECTS points (18 Elective), Major Disciplines (MD) with 60 ECTS points (24 Elective), and the "Final Attestation" with 12 ECTS credits. All areas, besides the "Final Attestation" include compulsory courses as well as electives. In total, students can choose electives, which encompass 47 ECTS points. The offer of elective disciplines ensures that students can build an individual learning trajectory.

The General Education Disciplines are not subject-specific and include courses such as "Module of Social and Cultural development", "Instrument Module", and "Physical Training". These courses are usually offered in the first semesters of the Bachelor's programme and all bachelor's students at KazNU (and all other Kazakh universities) have to take them – irrespective of their concrete study programmes.

The Core Disciplines in the Bachelor Data Science cover for example "Higher Mathematics and Programming Technologies", "Operating Systems and networks", "Data Science and

Artificial Intelligence”, “Algorithms and Data Structures”, “Databases and Data Security”. The Core Disciplines in the Bachelor Information Security Systems cover for example “Natural Sciences”, “Network Security Analysis”, “Software Security analysis”, “Operating Systems Security”, “Information security technologies”, and “Cybersecurity”. The Major Disciplines are more advanced courses, which are offered from the fifth semester. For the “Final Attestation” 12 ECTS points are awarded. It is carried out in the form of writing and defending a thesis (project) or preparing and passing a comprehensive exam.

The Master’s degree programme IT Management and the Master’s degree programme Information Security Systems are both designed for two years with 120 ECTS points and offered as full-time programmes.

The structure of both Master’s programmes is as follows:

- Core Disciplines (35 ECTS points), which consist of university components (20 ECTS points) and electives (15 ECTS points);
- Major Disciplines (49 ECTS points), which consist of university components (31 ECTS points) and electives (18 ECTS points);
- Research Work (24 ECTS points);
- Final Attestation (12 ECTS points).

The Core Disciplines of both Master’s programmes include courses such as “History and Philosophy of Science”, and “Psychology and Pedagogy Module”. The Major courses cover topics as “Theoretical methods of information security & Cybersecurity management”, “Theoretical methods of information security”, “Embedded control systems”, and “intelligent/Automated control systems” for the Master’s degree programme Information Security Systems and respectively “Researches in IS”, “Enterprise digital infrastructure management”, “Enterprise strategy and innovation management”, “Business Analytics and Operational Management” for the Master’s Degree programme IT-Management. As mentioned above, the experts conclude that the content of the Master’s degree programme IT Management does not quite match its name. In addition to computer science, there is also a strong focus on business topics, which would speak more in favor of a Master's degree programme Business Informatics, for example (see criterion 1.2).

The PhD degree programme Artificial Intelligence in Medicine and the PhD degree programme Information Security Systems are designed for three years with 180 ECTS points and offered as full-time programmes. Their structure is as follows:

- Core Disciplines (20 ECTS points), which consist of university components (15 ECTS points) and electives (5 ECTS points);

- Major Disciplines (25 ECTS points), which consist of university components (20 ECTS points) and electives (5 ECTS points);
- Research Work (123 ECTS points);
- Final Attestation (12 ECTS points).

The Core Disciplines of the PhD programme Information Security Systems include two courses on “Scientific Research tools”.

The Major Disciplines in the PhD programme Information Security Systems cover advanced subjects in information security and include courses such as “Information Theory and signal processing”, “Evaluation of cryptographic algorithms strength”, “Providing and analyzing security in web resources and payment systems based on cryptocurrency”, “Testing and Programming Security Systems”, “Reliability of cryptographic algorithms”, and “Cryptographic protection of information”.

The Core Disciplines of the PhD programme Artificial Intelligence in Medicine include courses such as “Scientific Research tools”, and “Teaching internship”.

The Major Disciplines in the PhD programme Artificial Intelligence in Medicine cover advanced subjects and include courses such as “Artificial Intelligence and signal processing”, “Machine Learning for Medical Diagnosis”, and “Embedded systems and their applications in healthcare”.

During the audit, the experts learn that the national education system continues to change and that the individual degree programmes may be designed even more individually in the future. The experts see this development positively and recommend the University and the programme coordinators to use the new liberalisation of the education system to redesign the ECTS structure to achieve international compatibility, especially with regard to the general education courses in the Master's degree programmes. Thus, on the one hand, these general education courses take up a relatively large amount of space at the beginning of the curriculum that could already be used for subject-specific courses. This is especially the case for the master's degree programmes, which only span 4 semesters. On the other hand, the modules are assigned ECTS points of between 3, 6, 8 or 9, which in turn makes international comparability more difficult, as it becomes difficult to find equivalent modules.

In the discussion with the peers, the employers express their satisfaction with the qualification profile of the graduates of all programmes under review. They point out that KazNU, especially in the area of computer sciences is one of the best universities in Kazakhstan and that there is a high demand for graduates. For this reason, they would like KazNU to educate more students so that the vacancies, can be filled.

After analysing the module descriptions and the study plans, the experts confirm that all degree programmes under review are divided into modules and that each module is a sum of coherent teaching and learning units. All practical lab work and internships are well integrated into the curriculum and the supervision by the Faculty of Informational Technologies as well as the Faculty of Medicine and Health Sciences guarantees for their respective quality in terms of relevance, content, and structure.

In summary, the peers confirm that the choice of modules and the structure of the curriculum ensure that the intended learning outcomes of the respective degree programme can be achieved.

International Mobility

KazNU provides some opportunities for students to conduct internships and exchange programmes abroad. Students who take part in student exchanges through cooperation programmes can gain recognition of the acquired credits after signing a learning agreement. The transfer of credits is carried out by the Registrar's Office on the basis of the student's application and the presentation of supporting documents in coordination with the Department Of Academic Affairs.

The Department of International Relations of KazNU is responsible for managing and coordinating the international activities such as coordinating and managing student mobility programmes, developing and maintaining relationships with partner institutions and organisations around the world, recruiting and admitting international students, providing support and assistance to international students during their time at KazNU, such as helping with housing, visa issues, and other practical matters.

The number of undergraduate and graduate students who participate in international exchange programmes is still low despite students' high interest. Undergraduate students in their third or fourth year of studies have the opportunity to join international universities.

The students confirm during the discussion with the peers that some opportunities for international academic mobility exist. However, they also point out that they wish for more places and better endowed scholarships for long- and short-term stays abroad. The number of available places in the exchange programmes is still limited and there are restrictions due to a lack of sufficient financial support. KazNU can provide only limited grants, while the demand from students is rising. The lack of financial support hinders students from joining the outbound programmes. National scholarships are available, but they are highly competitive, so only a few students receive them.

The peers understand these problems and see that academic mobility was severely impacted by the Corona pandemic, but the restrictions have been resolved and traveling and studying abroad is easily possible again. However, it would be useful to encourage students to take part at long term (one or two semesters) academic mobility programmes (e.g. ERASMUS+) in order to study or conduct research projects at universities abroad.

During the audit, the experts ask the teachers as well as the students whether and how well externally earned credits are recognised. In response, the students in particular describe that recognition has become much easier since the ECTS system came into effect. However, students do not always know in advance which courses can be recognised later. The students would like a little more clarity from the beginning. In conversations with teachers and programme coordinators, the experts also get the feeling that external achievements are usually credited for similar competences, but that there is not always a harmonised process. Therefore, the experts recommend that the process of how externally acquired credits can be recognised should be defined more clearly.

The peers emphasize that it is very useful for students to spend some time abroad already during their Bachelor's studies to improve their English proficiency, to get to know other educational systems, and to enhance their job opportunities.

In summary, the peers appreciate the effort to foster international mobility and support KazNU pursuing this path.

Criterion 1.4 Admission requirements

Evidence:

- Self-assessment report
- Webpage KazNU
- Order of the Minister of Education and Science of the Republic of Kazakhstan on October 31, 2018 № 600
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The admission procedure for the Bachelor programmes is constituted by regulations issued by the Kazakh Ministry of Education and conducted through a nationwide unified exam after completing the high school or professional school. 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 and Science defines a limited amount of scholarships for each

Bachelor's programme offered to those with the highest score. A state grant includes free tuition and a scholarship for living expenses. If a student has good grades in his first semesters at the University, she or he can apply during the studies for a state grant. It is also possible to enroll on a fee-paid basis; however, the required minimum score of the Unified National Test must still be met. Enrollment is carried out separately for each degree programme and study language (English, Kazakh, or Russian).

For admission to the Master's programmes applicants need to have a Bachelor's degree from a similar scientific background and have to pass an entrance exam, called comprehensive test (CT). Persons with a Master's degree and at least nine months of work experience are allowed to apply for doctoral studies and taking the entrance exam. Students applying for a Master's degree programme must first pass a test of foreign language (usually English) and then a subject specific test (written exam). The sum is the admission points that form the basis of the decision about the admission. PhD students need to provide verification of their English proficiency, pass a subject specific written test, submit an essay about their research ideas and pass an interview in order to get admitted. Students can appeal the results of the examinations at the ministry of foreign affairs, which leads to a new consideration of the decision by an additional commission.

In order to receive an educational grant from the state of Kazakhstan, students participate in the competition. If the students are not successful in achieving state funding, they can alternatively register for a paid education. International grants by the government are available and calculated based on a quota. The acceptance of the students depends on their results of the initial test and the number of applications and capacity in the study programme.

The experts ask the programme coordinators to explain the required competences of the students who want to enrol in the PhD programmes. The programme coordinators describe the principles of these regulations during the on-site visit and that it is possible to change from one Master's to another PhD programme; if skills and competences are missing, the student has to take additional courses to complement their knowledge. The expert panel acknowledges these descriptions and supports this mechanism.

In conclusion, the university's admission website informs potential students and stakeholders in detail about the requirements and the necessary steps to apply for admission into the programmes. The regulations also include rules for the recognition of qualifications achieved externally (e.g. at other higher education institutions or outside the higher education sector), which are clearly defined. KazNU facilitates the transition between higher education institutions and with non-university places of learning without jeopardizing the achievement of learning outcomes at the desired level. Since the regulations are based on

decrees by the ministry of education and on the university's written regulations, the peers deem them binding and transparent.

Criterion 1.5 Workload and Credits

Evidence:

- Self-assessment report
- Module descriptions of each study programme
- Study plan of each study programme
- Statistical data on student progress
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The study programmes are created following the basic principles of the Bologna Declaration. All study programmes therefore use European Credit Transfer System (ECTS) credits points to express the workload for students in each module, semester and academic year. The credits awarded are based on student workload, including both contact hours and self-study time as outlined for each course in the respective module descriptions. All mandatory components of the curricula award ECTS points for successfully mastering the module.

The two Bachelor's degree programmes award in total 240 ECTS points. The two Master's degree programmes award in total 120 ECTS points in the entire programmes whereas both PhD programmes comprise 180 ECTS points. One ECTS credit is equal to 30 hours of students' total workload. The standard duration of study for the Bachelor's degree programme is 4 years (8 semesters) for the Master's degree programmes is 2 years (4 semesters), and for the doctoral degree programmes it is 3 years (6 semesters). The module handbooks in each programme list precisely the average workload in hours in which the students need to complete the module. The university states in their self-assessment report that the expected workload allows the students to achieve the planned learning outcomes in each module and within the study programme as a whole. The number of awarded ECTS credit points is under regular review by the university considering the student evaluations and their discussions with their advisors.

As the statistical data provided by KazNU shows, the average length of study was 8 semesters in the two Bachelor's degree programmes, 4 semesters in the two Master's degree programmes and 6 semesters in both doctoral degree programmes in the last 4 years. Additionally, the peers see that almost all students complete the degree programmes as there

have only been few students of the different programmes who dropped out of the degree programmes in the last 4 years. The data verifies that the six degree programmes under review can be completed in the expected period.

In summary, the expert panel confirms that a credit point systems is used in all study programmes to express the students' workload. Credits are awarded for every module based on the respective workload. The estimated workload is realistic and well-founded, so that the study programs can be completed in the standard period of study. The modules of each programme are regularly evaluated to whether the credits awarded for each module correspond to the actual student workload and whether the distribution of the workload across all semesters enables graduation within the standard period of study. Students are involved in these processes by participating in the evaluation at the end of each course.

Criterion 1.6 Didactic and Teaching Methodology

- Self-assessment report
- Module descriptions of each study programme
- Discussions during the audit

Preliminary assessment and analysis of the experts:

As KazNU explains in the self-assessment report, the modules in the degree programmes under review contain both competence- and student-oriented parts and apply methods in which the students are actively integrated in the teaching process. Through the ECTS credit system (see chapter 1.5), an adequate balance between face-to-face activities and independent learning is already ensured for all courses. Besides the regular lectures and seminars, they use methods such as laboratory classes, practical classes, independent work of students with the teacher, independent work of students, coursework and practical classes. Therefore, the concepts of the entire programmes are well-balanced to teach the students technical competences as well as soft skills. Lectures are basically used to teach the students the theoretical foundations in one discipline, in particular to present solutions to specific analytical, experimental problems. Demonstrations are included into the lectures and involve giving students several problems to solve in a certain amount of time. Therefore, the university aims to keep their lectures interactive. The students confirm that these active and interactive methods are actually in use and that they are satisfied with the variety of teaching methods, which support them in achieving the learning outcomes.

KazNU wants to encourage the students to gain knowledge from different scientific areas and to introduce them to research activities. Therefore, students, especially in the PhD programmes further receive training and the opportunity to present at conferences and publish their scientific work.

Teaching and learning is supported by a broad range of media, both traditional (books, papers) and online (videos, presentations etc.). The university's online learning management system "Univer" supports teachers and students in communicating and disseminating learning material and also allows the students to have access to the syllabus of each module, which clearly state the teaching methods applied in each module. Additional guidelines are available for laboratory work and practical classes.

Moreover, the experts discuss with the students if online teaching is still taking place within their study programmes. The students explain to the experts that since 2022, all modules took place offline.

The experts acknowledge that the teaching staff applies a variety of teaching methods and didactic means to promote achieving the learning outcomes and support student-centred learning and teaching. Both teachers and students mention to the expert panel to consider having an adequate balance of contact hours and self-study time. The students are introduced to scientific work while practical work is part of their curricula as well. The expert panel confirms that the teaching methods are regularly reviewed in the process of evaluations at the end of each semester.

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

The name of the Masters' degree programme IT Management and its content have to correspond with each other. Furthermore, it is recommended to establish a better procedure for the recognition of credits gained abroad. In addition, it is recommended to take advantage of the new liberalisation of the education system to redesign the ECTS structure, especially with regard to general education courses in the Master's degree programmes, in order to achieve better international compatibility.

The experts consider criterion not to be completely fulfilled:

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, concept and organisation
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Evidence:

- Self-assessment report
- Module handbook of each study programme
- Sample of examination papers and final theses and dissertations provided during the audit
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The university describes in their self-assessment report that various examination methods can be applied at KazNU. To assess the achievement of the learning outcomes of one module, the main procedure is a combination of “current control”, “boundary control” and “final control (final exam).” The “current control” considers the systematic testing of the students’ knowledge in accordance to the syllabus. This method considers activity in the classroom and extracurricular work (including homework). Information on current control methods is mentioned in the syllabus in the online “Univer” system. Formative assessments are held in the form of two so-called “milestone controls”, each covering one-half of the semester syllabus. To pass this examination, students need to obtain an average of at least 50% to be admitted in order to participate in the final course examination. The final assessment takes the form of a comprehensive exam.

Alternative examinations are possible for online lectures and will be communicated with the students accordingly.

The standard assessment methods of KazNU apply a 100-point scale:

Letter Grade	Grade Point Value	Percentage	Conventional Grade
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	Satisfactory
C	2,0	65-69	
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	

FX	0,5	25-49	Failure
F	0	0-24	
I (Incomplete)	-	-	"Incomplete" (shall not be taken into account when calculating GPA)
AU (Audit)	-	-	"Audit" (shall not be taken into account when calculating GPA)
Cert.	-	30-60 50-100	"Certification" (shall not be taken into account when calculating GPA)
Uncert.	-	0-29 0-49	"Uncertification" (shall not be taken into account when calculating GPA)
R-difference	-	-	"Discipline difference on curriculum" (shall not be taken into account when calculating GPA)

The students are informed on the applied assessment methods in their syllabus and at the beginning of the lecture.

If students do not receive sufficient points to pass their exams, they are allowed to retake the exam once on a paid basis. A retake of the entire course is not mandatory. Students can also retake the exam if they want to improve their grades.

Every Master's student is required to do a thesis in the last year of their studies. For detailed information on the dissertation in the doctoral degree programmes, please refer to criterion D4. Prior to the actual research work, students of the two Master's degree programmes need to hand in a thesis proposal based on their research activities in the pre-thesis semesters. The thesis proposal is measured through an assessment rubric that has been agreed upon by the study programmes. The research proposal has to be accepted by the Dean and the supervisor committee who will then appoint the research supervisors.

Usually, there are one or two research supervisors for each student. One will act as the principal supervisor and the other act as co-supervisor. In case the student writes her or his thesis in collaboration with the industry, she or he is also assigned a supervisor from the industry. After completing the work on the thesis or dissertation, the student has to present and defend the results in front of teachers and fellow students.

The experts discuss with the programme coordinators, the members of the teaching staff, and the students about the process of finding suitable topic of the thesis or dissertation. Basically, there are two possibilities. Either students can propose their own ideas or they can ask their academic advisor or other teachers for suggestions.

During the on-site visit, the experts had access to a selection of exams and final projects. They confirm that these represent an adequate level of knowledge as required by the EQF level 6 for the two Bachelor's degree programmes, the EQF level 7 for the two Master's degree programmes and the EQF level 8 for the two doctoral degree programmes. The forms of exams are oriented in-line with the envisaged learning outcomes of the respective courses, and the workload is allocated in an acceptable way.

In conclusion, the experts consider the number of the examinations as adequate. The number and distribution of exams ensure an adequate workload as well as sufficient time for preparation. The experts especially have a positive impression of the organisation of the exams ensuring an unbiased and anonymous graduation of the written exams. The criteria for the examinations are clearly presented online and in the module handbooks. Students have an opportunity to consult their lecturers about the results of their exams and arrange a re-assessment of the exam if they consider it necessary. The experts confirm that all study programmes include a final thesis (see criterion 1.3).

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

The peers consider criterion 2 to be fulfilled.

3. Resources

Criterion 3.1 Staff and Development
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Evidence:

- Self-assessment report
- Staff handbook
- Discussions during the audit

Preliminary assessment and analysis of the peers:

At KazNU, the staff members have different academic positions. There are professors, associate professors, assistant professors, and lecturers. The academic position of each staff member is based on research activities, publications, academic education, supervision of students, and other supporting activities. For example, a full or an associate professor needs to hold a PhD degree. The responsibilities and tasks of a staff member with respect to teaching, research, and supervision depend on the academic position. In addition, there are non-academic staff members consisting of librarians, technicians and administrative staff.

The teaching staff is complemented by individual lecturers from industry and individual international visiting professors. In addition, technical staff, such as laboratory assistants and technicians, are employed to carry out the internships. The academic position of each lecturer is based on research activities, publications, academic education, student support and other supporting activities.

The auditors discuss with the programme coordinators the composition and qualification of the teaching staff. They learn that each member of the teaching staff is approved by the Rector of KazNU. The number of staff members is determined by the number of degree programmes, the amount of teaching workload, and the number of admitted students.

Finally, the auditors find out that almost all of the members of the teaching staff are involved in research activities. If teachers are scientifically successful their teaching workload can be reduced in favor of more time for research activities. The auditors conclude that the research activities carried out by the teaching staff are in line with and support the level of academic qualification aimed at.

The peers discuss with KazNU's management the way new staff members are recruited. They learn that every year the faculties and departments announce their vacancies to KazNU's management, which subsequently announces the vacancies nationally and internationally. However, the peers note that a large share of the teachers are graduates from KazNU. The representatives of the Rector's Office explain that KazNU is open to hire graduates from all universities, nevertheless, many members of the teaching staff are graduates from KazNU. This is also due to the fact that KazNU is one of the most prestigious universities in Kazakhstan and produces highly qualified graduates. The peers understand this reasoning but point out that KazNU should make sure that academic staff members also acquire scientific experience at other universities either in Kazakhstan or abroad.

In summary, the peers confirm that the composition, scientific orientation and qualification of the teaching staff are suitable for successfully implementing and sustaining both degree programmes.

Staff Development

The peers discuss with the members of the teaching staff the opportunities to spend time abroad and to participate in international projects. They learn that there are several international cooperations and that there is a special fund for financing the participation at international conferences. In addition, the members of the teaching staff can visit international partners that are involved in their research activities.

The members of the teaching staff mention that there is an internal qualification programme at KazNU in place that offers courses to improve the professional and didactic skills of the teachers. During the onsite visit the members of the teaching staff express their general satisfaction with their opportunities to further improve their teaching skills.

Long term stays abroad for conducting research projects are possible for all members of the teaching staff. Grants from different sources are available and during their absence the teaching load is covered by other teachers from the department. In general, the peers gain the impression that several opportunities for teachers exist to spend time abroad and to participate in international projects. The teachers confirm this positive assessment and state their satisfaction with the existing opportunities.

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

Student Support

KazNU provides an extensive support system for all students; it includes consultations with advisors about the individual educational plan and the study progress. Furthermore, the

advisor conducts educational work with the assigned students to improve their academic performance and to attract them to participate in social life at the university.

In addition, the students can contact their advisor any time for assistance in academic questions. The members of the teaching staff are available on any issues regarding the degree programmes and offer advice on particular modules, as well as on required papers or reports.

The peers learn that every student upon entering KazNU receives a student handbook which contains information about the organization of the chosen degree programme, on the preparation of an individual study plan, about the monitoring and evaluation of the learning achievements, and the organization of different kinds of internships.

The peer group notes approvingly the good and trustful relationship between the students and the teaching staff; there are enough resources available to provide individual assistance, advice, and support for all students. The support system helps the students to achieve the intended learning outcomes and to complete their studies successfully and without delay.

Criterion 3.2 Funds and equipment

Evidence:

- Self-assessment report
- Laboratory visitations during the audit
- Visits of the library during the audit
- Discussions during the audit

Preliminary assessment and analysis of the peers:

The university offers their students and staff technical, library and information resources to support their learning and research activities. Each study programme receives their budget from the Republic of Kazakhstan and additional organisations and funding agencies. Each student who does not receive a state grant, has to pay tuition fees in order to study at KazNU. The university has a large main campus, where fourteen dormitories offer more than 5,000 places to the students. Housing is also offered to the teaching staff to support visiting professors. In addition, KazNU offers free medical care for students and faculty members in a diagnostic centre on campus, which is operated in cooperation with the Yonsei University in Seoul (Korea). The access to Wi-Fi is available across campus.

KazNU offers a central library and information centre with reading rooms, study areas and a museum. Staff and students have additional access to the electronic library, which offers access to digital reading material, software and a zone for working with electronic resources. Access is granted for everyone via their online library, where scientific journals of the main publishers can be accessed. Furthermore, the library houses a historical collection of books and manuscripts dating back to the 16th century, of which some are presented in a small museum.

The university uses the electronic platform “Univer 2.0” as a central information source. Univer is an educational process management system, which offers digital workspaces for each employee. All study programmes at KazNU are organized using this system, which allows managing among other things the admission, curriculum and syllabus, student files, registration to modules and exams, examination scores or the study passport.

The faculty of Informational Technologies uses about 38 classrooms, 4 laboratories, and 11 computer rooms. Furthermore, “[t]o implement the educational program, the faculty has laboratories that are affiliated to world-renowned IT companies and equipped with state-of-the-art facilities, hardware and software: Siemens laboratory of industrial controllers, Internet of Things laboratory, CISCO networking academy lab, HP laboratory, National Instruments laboratory, Perco laboratory of technical security systems, Alcatel networking equipment laboratory, IP security laboratory.” In addition, “[t]he department's Internet of Things laboratory has created a theoretical and laboratory microcontroller base for studying industrial Internet of Things and embedded systems (IIoT and IoT), robotics with remote control, research on the application of neural networks and fuzzy logic in controlling mini-greenhouses.”

The experts ask the representatives of the rector’s office how they plan their budget. They describe to the experts that the university develops an income plan before planning their expenses. The total budget of the university is separated to the different departments and scientific projects. The income of the university is based on grants from the government and from student tuition fees. Currently, the university is investing in developing the campus by building new educational buildings and dormitories. Furthermore, new laboratories are planned as well as a raise in the salary for the teaching staff. In addition, KazNU spends money on projects to solve social problems including strategies against climate change, poverty, hunger and for sustainable communities.

The programme coordinators further explain the expert panel that the university receives special grants for each study programme. Therefore, the university has to compete with other universities for grants, including new grants to initiate the educational programmes

under review. Only after successfully acquiring governmental funding, the university is allowed to open new study programmes. Furthermore, the programme coordinators clarify that competition exists also for the PhD grants. The university has to apply for PhD grants at the government.

The expert panel considers the financial resources and the available equipment constitute a sustainable basis for delivering the degree programmes. The laboratories contain modern equipment, which allows the students to gain extensive practical experience during their studies. In the opinion of the expert panel, the infrastructure of both KazNU and the programmes under review are sufficient in terms of quantity and quality.

Therefore, the experts confirm that the financial resources and the available equipment at KazNU are suitable to operate the study programmes under review. This includes a secure funding and reliable financial planning, sufficient infrastructure in terms of both quantity and quality as well as binding regulation of internal and external cooperations.

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

The peers consider criterion 3 to be fulfilled.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Evidence:

- Self-assessment report
- Module descriptions of each study programme
- Webpage of each degree programme
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The module handbooks for all six degree programmes are published on the university's website and are thus accessible to the students as well as to all stakeholders.

The experts observe that they contain the necessary information about the persons responsible for each module, the teaching methods, the credit points awarded, the intended learning outcomes, the applicability and the forms of assessment.

However, the experts recognise that the information on module prerequisites in the individual module descriptions is not always coherent and consistent. On the one hand, it is not always clear whether the prerequisites mentioned refer to a specific module that should be attended beforehand or whether general basic knowledge from this area is required. On the other hand, it is not always comprehensible why a certain module is a prerequisite for another; for example, in the Bachelor's degree programme Information Security Systems the module "Optimal Control in Technical Systems" is a prerequisite for the module "Scientific Research Methods", whereby it is not clear to what extent the modules build on each other. In addition, information on the prerequisites is not given for all modules. Therefore, the experts agree that the module descriptions need to be revised and made consistent, especially with regard to the prerequisites for each module.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Self-assessment report
- Transcript of record provided during the audit
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The peers confirm that the students of the Bachelor's degree programme Information Security Systems and the Master's degree programme Information Security Systems are awarded a Diploma and a Diploma Supplement after graduation. The Diploma consists of a Diploma Certificate and a Transcript of Records. The Transcript of Records lists all courses that the graduate has completed, the achieved credit points, grades, and cumulative GPA. The Diploma Supplements contain all necessary information about the degree programmes. However, no corresponding Diploma Supplements could be provided for the four other study programmes, or no complete Diploma Supplements for the PhD degree programme Information Security Systems, as these do not describe any learning outcomes, for example.

Criterion 4.3 Relevant rules

Evidence:

- Self-assessment report
- Academic regulations
- KazNU webpage
- Webpage of each degree programme
- Discussion during the audit

Preliminary assessment and analysis of the experts:

The auditors confirm that the rights and duties of both KazNU and the students are clearly defined and binding. All rules and regulations are published on the university's website and the students receive the relevant course material at the beginning of each semester. This includes a syllabus, which contains more detailed information about the course's content, the exams and the exam schedule that the module descriptions.

In addition, all relevant information about the degree programmes (e.g., module hand-book, study plan, intended learning outcomes) is available on the English homepages of the programmes.

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

The experts agree that the module descriptions need to be revised and made consistent and that complete Diploma Supplements must be provided for all six study programmes.

The experts consider criterion 4 not to be fulfilled.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- Academic regulations
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The peers discuss the quality management system at KazNU with the representatives of the Rector's Office and the programme coordinators. They learn that there is an institutional system of quality management aiming at continuously improving the degree programmes. This system relies on internal as well as external quality assurance. Internal quality assurance encompasses all activities focused on implementing measures for improving the teaching and learning quality at KazNU. External quality assurance relies on international accreditation of the degree programmes.

The Accreditation Center for Institutional Studies of KazNU coordinates the work on organisational and methodological support of external procedures and conducts external quality assessment procedures through international accreditation and ensures the quality of its educational programmes in accordance with European standards and quality assurance recommendations. In order to improve the quality of its educational programmes, KazNU actively cooperates with international and national accreditation bodies and organisations to plan and implement measures for the accreditation of its educational programmes. International accreditation is considered as a means of increasing the university's international reputation and partnerships, as a mechanism for forming stronger ties with foreign labour markets, and increasing the number of universities employed in domestic and foreign markets.

Monitoring and evaluation of the quality of educational services at KazNU are carried out by the Department of Academic Affairs and the Center for Accreditation and Institutional Research. Reports on the results are provided to the Members of the Management Board, the Vice-Rector for Academic Affairs, and the Academic Council of the University for revising the curricula, quality assurance, and admission of students. On faculty level, the Academic Committees are responsible for implementing and monitoring the quality assurance measures.

KazNU carries out a detailed analysis and regularly monitors the results of the educational programmes through evaluation by the academic staff, employers, and students. The internal quality management system includes surveys by students, graduates and the teaching staff. Students have the chance to give a feedback on the study conditions, the study process organisation, and the content of the degree programmes. The surveys are conducted at the end of each semester and are accessible via the online platform "IS Univer". It is not compulsory to fill out the questionnaires, but if students do not participate, they cannot access their account on "IS Univer" until the survey is closed.

There is also a survey undertaken by the teaching staff. The questionnaire consists of several questions aimed at reviewing different aspects of teachers' activities in the fields of education, research and social life. Finally, employers usually give a feedback to KazNU about the quality and employability of the graduates. The Academic Committees analyse the surveys and if the results are negative they speak with the responsible teacher and try to solve the problems. Members of the Academic Committees visit the classes and listen to the lecture, if the negative evaluation continues the teacher may have to leave the university.

The peers gain the impression that the faculty of Information Technology take the students' feedback seriously and changes are made if necessary. Nevertheless, the peers see that the results of the course questionnaires are usually not discussed with the students. Consequently, the peers expect KazNU to inform students about the results of the questionnaires and the teachers should discuss with them about possible improvements in the respective course. The feedback loops need to be closed. The surveys could be conducted some weeks before the end of the semester, so that teachers can discuss with their students about the results and what improvement might be possible before the end of the semester.

To promote employment, the Office of Professional Development and Career of the Department of Academic Affairs ensures employers' involvement in holding events to inform students and graduates about employment opportunities and professional internships. Faculties provide constant communication with employers through Employer Councils formed among faculty graduates.

KazNU has a Student Senate, a Student Union "Sunkar", a Student Bureau of the Bologna Process, a Higher Student Council of Dormitories, a Scientific Student Society and several other organisations for students' activities. Students are given the opportunity to follow their own interests and are involved in the panels. As described in the Self-Assessment Report, the main objectives of student government are the protection and representation of students' rights and opinions as well as assisting students in dealing with educational, social or other issues affecting their life.

The peers discuss with the representatives of KazNU's partners from public institutions if there are regular meetings with the partners on faculty or department level, where they discuss the needs and requirements of the employers and possible changes to the degree programmes. They learn that some employers and alumni are invited to give their feedback on the content of the degree programmes in the course of the tracer studies. The peers appreciate that KazNU stays in contact with its alumni and the employers.

In summary, the peer group confirms that the quality management system is suitable to identify weaknesses and to improve the degree programmes. The students and all other stakeholders are involved in the process but not all feedback loops are closed.

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

The peers consider criterion 5 to be mostly fulfilled.

D Additional Criteria for Structured Doctoral Programmes

Criterion D 1 Research

Evidence:

- Self-assessment report
- Module descriptions of each study programme
- Sample of published articles in scientific journals
- Visits of the laboratories during the audit
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The university describes that doctoral students in both study programmes under review are actively conducting research. In the last years, this has led to several scientific publications in international journals. Students also participate at International symposia and conferences, where contributions were also published.

The number of students in each doctoral programme varies in each semester and might range from two new students to 13. A lecturer at KazNU and an international expert supervises the students' scientific work. Therefore, domestic and international scientists work

together to educate and guide the students in their process toward becoming independent scientists.

All doctoral programmes are required to follow their independent work plan and submit reports on their progress each semester. The feedback from their supervisors have to be stored to document their personal progress.

As a requirement for completing the doctoral programme, students have an obligation to publish scientific articles about their research results in an accepted journal. Four different schemes are accepted for publishing their research, varying based on the amount impact factor of the scientific journal and the number of publications required. Only one publication is required if the article is published in a Q1 journals whereas two articles are necessary in a Q2 journal. The university ensures that all scientific projects focus on novel research in their field of expertise.

Criterion D 2 Duration and Credits

Evidence:

- Self-assessment report
- Study plan for each degree programme
- Modules descriptions of each degree programme
- Discussions during the audit

Preliminary assessment and analysis of the experts:

Both PhD programmes under review at KazNU have a total of 180 ECTS credit points and a regular study time of three academic years or six semesters. The students receive their training in the basis of an individual work plan, which is developed with their scientific advisors. This plan can be updated annually and serves as a guide through studies, research, practice (internships) and publications. The research work is further discussed in each semester. Within one academic year, the students should complete 60 ECTS credits. Each doctoral study programme under review includes mandatory theoretical modules awarding 45 ECTS credits. Scientific research and publications of their results is compulsory in all doctoral programmes.

At the end of each semester, during the interim assessment of the research work, doctoral students submit a report on the implementation of their individual work plan at a meeting in the responsible department. In addition, at the end of each academic year, doctoral students report on the implementation of their research activities at a meeting of the Academic Council of the Faculty.

Criterion D 3 Soft Skills and Mobility

Evidence:

- Self-assessment report
- Data on student mobility
- Discussions during the audit

Preliminary assessment and analysis of the experts:

All doctoral students within the programmes under review have an external and foreign supervisor to guide the students in their research and personal development. The government supports the students with PhD grant, which also offer the students to participate in a short-term visit of their supervisors to discuss their scientific work and/or work in laboratories at another university. The International Academic Mobility Department processes the application to go abroad, who forwards the documents to a commission for approval.

Additional funding is available from the Ministry of Science and Higher Education to spend up to twelve months abroad for an internship. Currently, the university actively cooperates with 525 universities and research centres in 47 countries of the world. During the on-site visit, students report to have spent their internships in Australia, China, Turkey, Mexico and the USA.

Students are further encouraged to join international conferences. Funding for these meetings are often provided by their research projects or their international collaboration partners.

Criterion D 4 Supervision and Assessment

Evidence:

- Self-assessment report
- Discussions during the audit

Preliminary assessment and analysis of the experts:

Within the doctoral programmes under review, each student has at least two scientific supervisors during their studies. One supervisor has to be based at KazNU while the second supervisor needs to be from a foreign educational programme with experience in issuing PhDs. These supervisors are involved in the development and approval of an individual work plan for each student considering their scientific research topic and skills. They men-

tor and guide the student's work during the preparation of the doctoral dissertation, monitor the quality of the student's research work, encourage participation in scientific projects and the publication of the results.

The university further has to provide the necessary conditions in order to conduct the intended research at their own or cooperating facilities. The academic supervisors work in close collaboration with the students and provide assistance and advice in the research process. At the end of each semester, the doctoral students have to prepare a report on their process, which has to be presented at an interim assessment of the graduating department. Furthermore, at the end of each academic year, the students need to present their progress in front of the Academic Council at the faculty at KazNU. The university has issued official guidelines and requirements for PhD students. These rules outline the requirements for graduations which include mandatory publications.

Both doctoral programmes are completed with passing all scheduled exams, preparation and defence of the doctoral dissertation.

Criterion D 5 Infrastructure

Evidence:

- Self-assessment report
- Visit of the laboratories during the audit
- Access to current scientific publications
- Discussion during the audit

Preliminary assessment and analysis of the experts:

KazNU offers their doctoral students access to laboratories to learn skills and perform their own experiments and scientific work. The university states that over the past 10 years, they have created a modern laboratory base that allows them to set up unique experiments explore and obtain excellent scientific results.

Moreover, all students have free access to international databases such as Scopus, and can also access polytext versions of publications, journals and articles.

Criterion D 6 Funding

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

Doctoral students at KazNU have to initially compete to receive grant funding for their scientific and technical projects. These grants are issued by the Ministry of Science and Higher Education of the Republic of Kazakhstan. To enrol in one of the PhD programmes, the students need to successfully obtain a grant funding in order to conduct their studies and research. Additional grants are offered by the Yessenov Scientific and Educational Foundation, the AbayVern scholarship programme or international grants such as Erasmus+. In addition, KazNU offers scholarships to conduct research activities abroad and for participating in international conferences and workshops.

Criterion D 7 Quality Assurance

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the experts:

As a state university, KazNU follows the rules and regulations for doctoral studies in the Republic of Kazakhstan. Oversight of all doctoral programmes has the Office of Academic Affairs and the Department of training and certification at KazNU. Admission to doctoral studies is carried out in accordance with the Rules for Admission to Education in Educational Organizations Implementing Educational Programmes of Higher Education and Postgraduate Education. The preparation of doctoral students is carried out within the framework of the state educational order and on the basis of contracts for the provision of educational services for a fee, concluded between the university and the customers of educational services. The university guarantees that rules of good scientific practice are followed.

During their studies, doctoral students have to closely follow the guidelines developed with their supervisors as the study at KazNU requires a timely and efficient performance.

The faculty collects data related to individual progression, net research time, completion rate, dissemination of research results, and career tracking and uses this data to continuously assess the quality of the structured doctoral programmes.

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

The peers consider criterion D to be fulfilled.

E 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:

No additional documents needed

F Summary: Peer recommendations

The experts summarize their analysis and **final assessment** for the award of the seals as follows:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Information Security Systems	With requirements for one year	–	30.09.2029
Ma Information Security Systems	With requirements for one year	–	30.09.2029
PhD Information Security Systems	With requirements for one year	–	30.09.2029
Ba Data Science	With requirements for one year	–	30.09.2028
Ma IT Management	With requirements for one year	–	30.09.2028
PhD Artificial Intelligence in Medicine	With requirements for one year	–	30.09.2028

Requirements

For all degree programmes

- A 1. (ASIIN 4.1) The module descriptions must be revised and made consistent; especially with regard to the prerequisites for each module.
- A 2. (ASIIN 4.2) Provide students with Diploma Supplements for all degree programmes.
- A 3. (ASIIN 5) Teachers need to discuss with their students the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

For the Master's degree programme IT Management

- A 4. (ASIIN 1.2) The name of the Master's degree programme in IT Management and its content must correspond with each other.

Recommendations

For all degree programmes

- E 1. (ASIIN 1.3) It is recommended to establish a better procedure for the recognition of credits gained abroad.
- E 2. (ASIIN 1.3) It is recommended to take advantage of the new liberalisation of the education system to redesign the ECTS structure, especially with regard to general education courses in the Master's degree programmes, in order to achieve better international compatibility.

G Comment of the Technical Committee 04 - Informatics/Computer Science

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure and follows the assessment of the experts without any changes.

The Technical Committee 04 – Informatics/Computer Science recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Information Security Systems	With requirements for one year	–	30.09.2029
Ma Information Security Systems	With requirements for one year	–	30.09.2029
PhD Information Security Systems	With requirements for one year	–	30.09.2029
Ba Data Science	With requirements for one year	–	30.09.2028
Ma IT Management	With requirements for one year	–	30.09.2028
PhD Artificial Intelligence in Medicine	With requirements for one year	–	30.09.2028

H Decision of the Accreditation Commission (23.06.2023)

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

The AC makes editorial changes to requirement A 3 and recommendation E 2. Apart from that, the TC follows the assessment of the experts and the TC without any changes.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Subject-specific label	Maximum duration of accreditation
Ba Information Security Systems	With requirements for one year	–	30.09.2029
Ma Information Security Systems	With requirements for one year	–	30.09.2029
PhD Information Security Systems	With requirements for one year	–	30.09.2029
Ba Data Science	With requirements for one year	–	30.09.2028
Ma IT Management	With requirements for one year	–	30.09.2028
PhD Artificial Intelligence in Medicine	With requirements for one year	–	30.09.2028

Requirements

For all degree programmes

- A 1. (ASIIN 4.1) The module descriptions must be revised and made consistent; especially with regard to the prerequisites for each module.

- A 2. (ASIIN 4.2) Provide students with Diploma Supplements for all degree programmes.
- A 3. (ASIIN 5) Teaching staff need to discuss with their students the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

For the Master's degree programme IT Management

- A 4. (ASIIN 1.2) The name of the Master's degree programme in IT Management and its content must correspond with each other.

Recommendations

For all degree programmes

- E 1. (ASIIN 1.3) It is recommended to establish a better procedure for the recognition of credits gained abroad.
- E 2. (ASIIN 1.3) It is recommended to redesign the ECTS structure, especially with regard to general education courses in the Master's degree programmes, in order to achieve better international compatibility.

I Fulfilment of Requirements (28.06.2024)

Analysis of the experts and the Technical Committees (14.06.2024)

Requirements

For all degree programmes

- A 1. (ASIIN 4.1) The module descriptions must be revised and made consistent; especially with regard to the prerequisites for each module.

Initial Treatment	
Experts	<p>Not fulfilled.</p> <p>Justification: The experts still identify some discrepancies in the module handbooks. In some disciplines, it is unclear what constitutes a prerequisite and what constitutes a post-requisite. Additionally, some courses are not listed in the Module Descriptions at all. For instance, in the course "History and Philosophy of Science", "Epistemology", "Ethics", and "Aesthetics" are listed as post-requisites, although these subjects are not included in the Handbook. A similar situation arises with the course "Semantic-based Analysis for Information Assurance," where "Fundamentals of Cybersecurity" is listed as a post-requisite, and with the course "Models and Methods of the Theory of Neural Networks", where "Algorithmization and Data Structures", "Architecture of Computer Systems", "Cyber Security of Information", and others are listed as post-requisites, none of which are included in the Handbook. In the Data Science programme, for example, in the "Data Security" and "Statistical Computing and Data Analysis" courses "Distributed Databases and Database Design for Web" and "Mathematical Forecasting of Business Processes", "Processing of Internet Data", respectively, are listed as post-requisites, but these courses are also absent from the Handbook. Furthermore, the experts notice that doctoral programmes do not specify prerequisites and post-requisites for courses. Therefore, it is still necessary to review and adjust the module descriptions, especially regarding the information on prerequisites and post-requisites.</p>
TC 04	<p>Not fulfilled.</p> <p>Vote: unanimous</p> <p>Justification: The TC discusses the procedure and follows the experts' assessment without any changes.</p>

TC 07	Not fulfilled. Vote: unanimous Justification: The TC discusses the procedure and follows the experts' assessment without any changes.
AC	Not fulfilled. Vote: unanimous Justification: The AC discusses the procedure and follows the assessment of the experts and the technical committees without any changes.

A 2. (ASIIN 4.2) Provide students with Diploma Supplements for all degree programmes

Initial Treatment	
Experts	Not for all programmes fulfilled. Justification: The university provides complete Diploma Supplements for the following degree programmes: Ba & Ma & PhD Information Security Systems, and Ma IT Management. However, for the Bachelor's degree programme Data Science and the PhD's programme Artificial Intelligence in Medicine, KazNU does not submit any Diploma Supplements with the justification that there are no graduates in either programme and therefore no corresponding Diplomas yet. Although, the experts can understand that there are no graduates yet, they point out that the university must submit at least one exemplary Diploma Supplement for all programmes under review in order to meet the requirement and that no actual graduates are needed to create such an example.
TC 04	Not for all programmes fulfilled. Vote: unanimous Justification: The TC discusses the procedure and follows the experts' assessment without any changes.
TC 07	Not for all programmes fulfilled. Vote: unanimous Justification: The TC discusses the procedure and follows the experts' assessment without any changes.
AC	Not for all programmes fulfilled. Vote: unanimous Justification: The AC discusses the procedure and follows the assessment of the experts and the technical committees without any changes.

- A 3. (ASIIN 5) Teaching staff need to discuss with their students the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

Initial Treatment	
Experts	Not fulfilled. Justification: Although KazNU describes in its documentation that students can access the results of surveys on demand, the provided link to a university webpage does not give any special regulations in this regard. Currently, the experts do not see any evidence that ensures that students are informed of the results of surveys they participate. The experts specify that the feedback to students on the results and actions taken based on their surveys should take place on a regular basis
TC 04	Not fulfilled. Vote: unanimous Justification: The TC discusses the procedure and follows the experts' assessment without any changes.
TC 07	Not fulfilled. Vote: unanimous Justification: The TC discusses the procedure and follows the experts' assessment without any changes.
AC	Not fulfilled. Vote: unanimous Justification: The AC discusses the procedure and follows the assessment of the experts and the technical committees without any changes.

For the Master’s degree programme IT Management

A 4. (ASIIN 1.2) The name of the Master’s degree programme in IT Management and its content must correspond with each other.

Initial Treatment	
Peers	<p>Not completely fulfilled</p> <p>Justification: KazNU states that the content of the disciplines "Information Technologies of Risk Management", "Business Intelligence Systems", "Startup and Innovation Management", "Models and methods of strategic management" were adjusted in the program "7M06113 IT Management". The disciplines "Information Technologies in Financial Management", "Digital marketing information technologies" have been replaced with disciplines necessary for an IT management specialist, as modern tools for IT management and project management in an organization "Enterprise networks and distributed systems", "Agile Project Management".</p> <p>The experts’ concerns were that the taught content of the Master’s degree programme IT Management does not correspond to the Title. It is much more closer to programmes called <i>Business Informatics</i> or <i>Commercial Information Technology</i>. The experts refer to the definition by IBM: "IT management refers to the monitoring and administration of an organization’s information technology systems: hardware, software and networks. IT managers monitor and govern IT systems to ensure they’re always available and function reliably. IT management responsibilities and tasks include:</p> <ul style="list-style-type: none"> • Determining business requirements for IT systems • Managing IT budgets and costs • Monitoring safety and compliance • Controlling system and network security." <p>Accordingly to this, the experts haven’t required, just to "add more IT-related disciplines". The requirement was to align the programme’s content and name, whether by modifying the program fundamentally, not only add some keywords to the course "7M06113 IT Management", or by changing the programme’s title.</p> <p>Summing up, the experts recognize the changes that have been made and see this as a positive development. However, they are not yet convinced that enough content from the IT Management direction has been implemented to retain the title "IT management". Therefore, the experts still see an insufficient match between the content and title of the programme.</p>
TC 07	<p>Fulfilled.</p> <p>Vote: unanimous</p>

	<p>Justification: The TC discusses the procedure and is of the opinion that the university has already made good progress. In addition, the TC is of the opinion that the experts provide too narrow a definition of IT management and cites two other definitions: Lexicon Resch: "IT management addresses the management of IT in a broader sense. Management theory names planning, organization, personnel deployment, leadership and control as aspects of management." or also Lexicon Gabler: "IT management addresses the management of IT in a broader sense. For IT management, IT in the sense of information technology, e.g. hardware and software, is a means that is used to achieve a specific purpose. Although information technology is of central interest, IT management also has to consider other means, such as personnel and organizations, which are related to the creation, operation and use of information technology and therefore also belong to IT in the broad sense." The TC therefore comes to the conclusion that the university has already taken sufficient steps and that there are now enough modules in the entire curriculum to qualify as an IT Management degree program and that the requirement can therefore be considered fulfilled.</p>
AC	<p>Fulfilled. Vote: unanimous Justification: The AC discusses the procedure and follows the assessment of the TC 07. Therefore, it considers requirement A 4 to be fulfilled.</p>

Decision of the Accreditation Commission (28.06.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Information Security Systems	Requirements 1, 3 not fulfilled	-/-	6 months prolongation
Ma Information Security Systems	Requirements 1, 3 not fulfilled	-/-	6 months prolongation
PhD Information Security Systems	Requirements 1, 3 not fulfilled	-/-	6 months prolongation
Ba Data Science	Requirements 1, 2, 3 not fulfilled	-/-	6 months prolongation
Ma IT Management	Requirements 1, 3 not fulfilled	-/-	6 months prolongation

I Fulfilment of Requirements (28.06.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
PhD Artificial Intelligence in Medicine	Requirements 1, 2, 3 not fulfilled	-/-	6 months prolongation

J Fulfilment of Requirements (16.10.2024)

Analysis of the experts and the Technical Committees (25.11.2024)

Requirements

For all degree programmes

- A 1. (ASIIN 4.1) The module descriptions must be revised and made consistent; especially with regard to the prerequisites for each module.

Secondary Treatment	
Experts	Fulfilled. Justification: The module descriptions have been reviewed again and now every module contains a brief mentioning of "Required and recommended prerequisites for the discipline". So, as a conclusion, this requirement is fulfilled.
TC 04	Fulfilled. Justification: The TC follows the experts' assessment without any changes.
TC 07	Fulfilled. Justification: The TC follows the experts' assessment without any changes.

- A 3 (ASIIN 5) Teaching staff need to discuss with their students the results of the questionnaires and what improvements might be possible, the feedback cycles need to be closed.

Secondary Treatment	
Experts	Fulfilled. Justification: The experts looked at the survey of 2024 and found comprehensive course evaluations. Also, the records of the meetings indicate that there has been a discussion about the evaluations and measures within the teaching staff as well as with students. Therefore, the requirement can be considered fulfilled.
TC 04	Fulfilled. Justification: The TC follows the experts' assessment without any changes.

TC 07	Fulfilled. Vote: unanimous Justification: The TC follows the experts' assessment without any changes.
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For the Bachelor's programme Data Science & the PhD programme Artificial Intelligence in Medicine

A 2. (ASIIN 4.2) Provide students with Diploma Supplements for all degree programmes

Secondary Treatment	
Experts	Fulfilled. Justification: The university now provides corresponding diploma supplements that contain all the required information.
TC 04	Fulfilled. Justification: The TC follows the experts' assessment without any changes.
TC 07	Fulfilled. Justification: The TC follows the experts' assessment without any changes.

Decision of the Accreditation Commission (06.12.2024)

Degree programme	ASIIN-label	Subject-specific label	Accreditation until max.
Ba Information Security Systems	All requirements fulfilled	-/-	30.09.2029
Ma Information Security Systems	All requirements fulfilled	-/-	30.09.2029
PhD Information Security Systems	All requirements fulfilled	-/-	30.09.2029
Ba Data Science	All requirements fulfilled	-/-	30.09.2028
Ma IT Management	All requirements fulfilled	-/-	30.09.2028
PhD Artificial Intelligence in Medicine	All requirements fulfilled	-/-	30.09.2028

Appendix: Programme Learning Outcomes and Curricula

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Information Security Systems:

- “LO1. use the provisions of security standards and evaluate their role in protecting data and resources;
- LO2. apply mathematical methods of coding, cryptography and cryptanalysis in data protection problems;
- LO3. apply the basic provisions of normative legal acts in the field of information security;
- LO4. use programming languages and tools to develop secure software and mobile applications;
- LO5. use risk management principles to assess threats, vulnerabilities, counter-measures and impact on risks in information systems;
- LO6. troubleshoot, maintain, and update enterprise-level information security systems;
- LO7. continuously monitor the network and provide real-time security solutions;
- LO8. plan, implement, and perform security audits of operating systems and applications;
- LO9. plan incident response, disaster recovery, and business continuity as part of information security;
- LO10. design components of information security systems;
- LO11. to evaluate the risk management policy information security and applications;
- LO12. to demonstrate knowledge of the basic laws of functioning and development of nature and society, the ability to adequately navigate in various socio-economic, socio-legal, ethical, political and emergency situations.”

The following **curriculum** is presented:

Module/Disciplines	ECTS	Workload HPW				Term
		lec.	sem.	lab.	other	
<u>Module of social and cultural development</u>	18					
<u>History of Kazakhstan</u>	5	1	2			1

0 Appendix: Programme Learning Outcomes and Curricula

Philosophy	5	1	2			4
Sociology	2					1
Political science	2					1
Culture	2					1
Psychology	2					1
Instrumental module	25					
Foreign Language	10		3			1&2
Kazakh (Russian) Language	10		3			1&2
Information and Communication Technologies	5	2		1		3
Module Physical Training	8					
Physical Training	8					1-4
Elective component (1 of 6)	5	1	2			2
al-Farabi and modernity						
Abai 's Teaching						
Legal bases of corruption control						
Ecology and Human Life Safety						
Entrepreneurship						
Scientific Research methods						
Module of natural Sciences	18					
Mathematics	9	2	4			1
Programming languages	6	1	1	2		2
Educational practice	3				3	2
Network Security Analysis	15					
Discrete mathematics	6	2	2			3
Network security	9	2		4		4
Software security analysis	18					
Object-Oriented Programming	9	2		4		3
Information basics of information protection	9	2	2	2		4

0 Appendix: Programme Learning Outcomes and Curricula

<u>Operating Systems Security</u>	13					
<u>Operating Systems Security</u>	9	2		4		3
<u>Professional Practice</u>	4				4	4
<u>Information security technologies</u>	15					
<u>Computer forensics</u>	6	2		2		5
<u>Database Theory</u>	6	2		2		6
<u>Professional Practice</u>	3				3	6
<u>Cybersecurity</u>	15					
<u>Cybersecurity</u>	6	2		2		7
<u>Professional Practice</u>	9				9	8
<u>Ensuring information security</u>	18					
<u>Technical means and methods of information protection</u>	6	2		2		5
<u>Theory of information and coding</u>	6	2	2			6
<u>Security information management</u>	6	2		2		6
<u>Programming of security systems</u>	18					
<u>Programming in Java</u>	6		1	3		5
<u>Web Design</u>	6		1	3		6
<u>Computer crimes and malicious software</u>	6	2		2		6
<u>The module of the latest technologies</u>	18					
<u>Python programming language</u>	6		1	3		5
<u>Machine learning</u>	6	2		2		6
<u>Models and methods of intellectual information systems</u>	6	2		2		6
<u>Examination of security systems</u>	27					
<u>Web security</u>	9	2		4		5
<u>Cryptography and Cryptanalysis</u>	9	1	1	4		5
<u>Security monitoring system</u>	9	2	2	2		6
<u>Regulatory and legal module</u>	9					

Regulatory and legal support of information security	6	2	2			7
Professional Practice	3				3	8
Cryptanalysis Module	24					
Cryptanalysis of block ciphers	9	1	1	4		7
Cryptographic analysis of open cryptography methods	9	1	1	4		7
Technical Control systems	6	2		2		7
Information Security Module	24					
System administration	9	2		4		7
Network security audit	9	2		4		7
Security software	6	2		2		7
Intelligent data analysis	24					
Data mining	9	2		4		7
Information technologies for combating extremism	9	2		4		7
IT infrastructure	6	2		2		7
FINAL ATTESTATION	12				12	8
TOTAL	240					

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master's degree programme Information Security Systems:

- “LO1. [...] determine the content, methods and means of training in accordance with the objectives of the course for the development of teaching materials and lectures, practical classes to carry out educational activities in professional educational institutions based on psychological and pedagogical principles;
- LO3. describe the regulatory legal acts, international and state standards in the field of information security;
- LO4. choose and reasonably use methods and hardware-software information protection;

- LO4. [...] analyze threats to information security facilities and methods of counter-action;
- LO5. evaluate the cryptographic strength of encryption algorithms;
- LO6. use methods to improve the security of data transmission in telecommunication networks;
- LO7. identify vulnerabilities of cryptographic protocols and transformations, and effectively apply them to solve applied problems;
- LO8. understand the composition and structure of cloud and mobile technologies, the theory of neural networks, mining, and also use the methods of semantic analysis;
- LO9. use analytical and experimental research methods to put forward hypotheses on the topic of scientific research using knowledge in the field of history and philosophy of science, a subject field, speak English as a means of communication in professional and scientific activities;
- LO10. organize debugging and testing of software, hardware, and software information security.”

The following **curriculum** is presented:

Module/Disciplines	ECTS	Workload HPW				Term
		lec.	sem.	lab.	other	
<u>History and philosophy of science</u>	9					
History and philosophy of science	3	1	2			1
Foreign Language (professional)	6		6			2
<u>Psychology and Pedagogy Module</u>	11					
Pedagogy of higher education	3	1	2			1
Psychology	3	1	2			2
Teaching Internship	5				5	2
<u>Information security audit</u>	15					
Policies and models of access control in computer systems	6	2		2		1
Analysis of Network Security	9	2		4		2
<u>Machine Learning and Semantic Analysis Module</u>	15					

0 Appendix: Programme Learning Outcomes and Curricula

A Semantic-based Analysis for Information Assurance	6	2		2		1
Models and methods of the theory of neural networks	9	2		4		2
Information Security Technologies	15					
Cyber security of information	6	2		2		1
Theoretical-numerical methods of cryptography	9	2		2		2
Theoretical methods of information security	18					
Organization and planning of scientific researches (English)	6	2	2			1
Cryptanalysis	6	2		2		1
Security analysis of operating systems	6	2		2		2
Cybersecurity Management	13					
Organization of information security systems	9	2	2	2		3

Module/Disciplines	ECTS	Workload HPW				Term
		lec.	sem.	lab.	other	
RESEARCH PRACTICE	4				4	3
Organization of information security systems	18					
Computer Forensics and Competitive Intelligence (OSINT)	9	2		4		3
Audit of information security	9	2		4		3
Information security technologies	18					
Management technologies of information security	9	2		4		3
Security of Web-Applications	9	2		4		3
Cryptosystem Management	18					
Principles of construction of cryptographic protocols	9	2		4		3
Key management in cryptosystems	9	2		4		3
MASTER'S STUDENT RESEARCH	24					
Research Seminar	3				1	1,2,4

Dissertation Writing	14				4	1-4
Scientific Internship	3				3	4
Publication in the Proceedings of International Conferences	4				4	4
FINAL ATTESTATION	12				12	4
TOTAL	120					

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD programme Information Security Systems:

- LO1. demonstrate a systematic understanding of information security techniques and tools;
- LO2. justify the choice of decision-making methodology to ensure the protection of information;
- LO3. demonstrate knowledge of patent search procedures, protection of intellectual property rights to scientific discoveries and developments;
- LO4. analyze and evaluate, improve processes, develop specifications and design information security systems;
- LO5. classify methods for ensuring and assessing security in information processing systems (operating systems and applications, networks, protocols);
- LO6. to analyze the existing methods and means used for the control and protection of information, and to develop a proposal for their improvement and increase the effectiveness of this protection;
- LO7. identify similarities and differences in methods and systems of protection, security assessment and measures taken to protect information, methodology for creating secure information systems;
- LO8. develop software for innovative projects using the latest technological solutions;
- LO9. evaluate the cryptographic strength of block ciphers, the synthesis of ciphers, encryption systems with public keys, key distribution protocols, identification, organization of confidential communication networks;
- LO10. analyze, evaluate and synthesize new and complex ideas in the field of information security; formulate innovative scientific tasks in the field of design and development of information security systems;

- LO11. to prepare on the basis of the results of the research publications that deserve coverage at the national and international levels, scientific and technical reports, reviews;
- LO12. to substantiate the obtained scientific results in the field of information security in front of the wider scientific.”

The following **curriculum** is presented:

Module/Disciplines	ECTS	Workload HPW				Term
		lec.	sem.	lab.	other	
<u>Scientific-Research tools</u>	15					
<u>Academic writing</u>	2		1			1
<u>Scientific Research methods</u>	3	1	1			1
<u>Teaching Internship</u>	10				10	2
<u>Models and methods of information security assessment (1 of 2)</u>	5					
<u>Theory, methods and tools of cryptography</u>	5	1		2		1
<u>Development of information security tools</u>	5	1		2		1
<u>Evaluation of cryptographic algorithms strength</u>	20					
<u>Evaluation of cryptographic algorithms strength</u>	5	1		2		1
<u>Models and methods of information assessment</u>	5	1		2		
<u>Research Practice</u>	10				5	3,4
<u>Providing and analyzing security in web resources and payment systems based on cryptocurrency(1 of 2)</u>	5					
<u>Machine learning algorithms for Information Assurance</u>	5	1		2		1
<u>Analysis of Cryptocurrency technologies security</u>	5	1		2		1
<u>Testing and Programming Security Systems (1 of 2)</u>	5					
<u>Programming of security systems</u>	5	1		2		1
<u>Testing security systems</u>	5	1		2		1

<u>Reliability of cryptographic algorithms (НИИ)</u> (1 of 2)	5					
<u>Cryptographic generators of pseudo-random sequences, the assessment of their quality</u>	5	1		2		1
<u>Cryptanalysis</u>	5	1		2		1
<u>Cryptographic protection of information (НИИ)</u> (1 of 2)	5					
<u>Cryptographic techniques based on modular arithmetic</u>	5	1		2		1
<u>Cryptographic Key Management Systems</u>	5	1		2		1
<u>RESEARCH</u>	123					
<u>Research Seminar</u>	26				26	1-6
<u>The implementation of a Doctoral Thesis</u>	41				41	1-6
<u>Publication in the Proceedings of International Conferences</u>	17				3	2-5
<u>Publication in journals recommended by CCSES or indexed by Web of Science, Scopus Databases</u>	31				15	2-6
<u>Scientific Internship</u>	8				10	5,6
<u>FINAL ATTESTATION</u>	12				12	8
TOTAL	180					

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor's degree programme Data Science:

- “LO 1. Analyze the features of social, political, cultural institutions in the context of their role in the modernization of Kazakhstan society, describe the stages of the formation of an independent Kazakhstan statehood in the context of the global and Eurasian historical process.
- LO 2. Apply the methods of mathematical analysis, probability theory, algebra and discrete mathematics, statistical calculations and optimization principles for the correct formulation and solution of data analysis problems.

- LO 2. Configure the operating system, apply network data transfer protocols, mechanisms and methods for protecting computing resources from attacks, determine data sources, adapt a scalable computing infrastructure to solve various classes of data analysis problems.
- LO 3. Define clear requirements for the problem, decompose the problem, use efficient strategies to obtain an algorithmic solution, implement solutions through programming in a suitable high-level language, evaluate and compare different data analysis algorithms.
- LO 5. Establish criteria for selecting an adequate scalable data management technology based on given criteria, tune the database to achieve the best performance, adequately consider security aspects in databases, select and use cloud data service technologies, summarize the basic principles and capabilities of managing virtualized and distributed data.
- LO 6. Analyze data by appropriately fitting, evaluating, visualizing and interpreting various statistical models, using statistical methods, using standard statistical software packages.
- LO 7. Develop and implement components of artificial intelligence systems to improve the speed and quality of data processing and decision making, develop, implement and use various data representations for classification and regression, determine suitable tools and methods for solving the main classes of machine learning problems, including deep learning methods .
- LO 8. Model logical data structures, defining data composition, data structure and sources, ensuring data protection, use the data collection process to ensure the completeness and interconnectedness of data from different sources and to develop solutions for optimizing data storage and processing.
- LO 9. Assess technology opportunities and innovations based on big data, evaluate data scale and application speed at multiple scale levels, apply big data ecosystem methods and tools.
- LO 10. Implement and apply advanced data mining methods with appropriate tools, evaluate and compare the suitability, scalability and performance of various methods in practical conditions, complete the full cycle of data mining, solve practical data mining problems.
- LO 11. Be professionally and ethically responsible in areas such as data citation and ownership, data security and privacy, data analysis privacy implications and concerns.

- LO 12. Possess the necessary and sufficient level of communicative competence for the active use of a foreign language, both in everyday and professional communication, work in a team, tolerantly perceiving social, ethnic and cultural differences, critically evaluate their own activities, the activities of the team.”

The following **curriculum** is presented:

<u>Module/Disciplines</u>	<u>ECTS</u>	<u>Workload HPW</u> <i>(Часы в неделю)</i>				<u>Term</u>
		<u>lec.</u>	<u>sem.</u>	<u>lab.</u>	<u>other</u>	
<u>M-1 Module of social and cultural development</u>						
<u>Modern history of Kazakhstan</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>Philosophy</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>Sociology/ Political science/ Culture/ Psychology</u>	<u>8</u>	<u>4</u>	<u>1</u>			
<u>M-2 Instrumental module</u>						
<u>Information and Communication Technologies</u>	<u>5</u>	<u>2</u>		<u>1</u>		
<u>Foreign Language</u>	<u>10</u>		<u>3</u>			
<u>Kazakh (Russian) Language</u>	<u>10</u>		<u>3</u>			
<u>M-3 Module Physical Training</u>						
<u>Physical Training</u>	<u>8</u>		<u>2</u>			
<u>ELECTIVE COMPONENT</u>						
<u>Al-Farabi and modernity</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>Abai 's Teaching</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>Ecology and Human Life Safety</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>Entrepreneurship</u>	<u>5</u>	<u>1</u>	<u>2</u>			
<u>M-4 Higher Mathematics and Programming Technologies</u>						
<u>Mathematics-1 (Mathematical Analysis, theory of probability and mathematical statistics)</u>	<u>9</u>	<u>2</u>	<u>4</u>			
<u>Programming Technologies</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Educational practice</u>	<u>3</u>					
<u>M-5 Operating Systems and Networks</u>						
<u>Mathematics-2 (Algebra and discrete mathematics)</u>	<u>6</u>	<u>2</u>	<u>2</u>			
<u>Operating Systems and Computer Networks</u>	<u>9</u>	<u>2</u>		<u>4</u>		
<u>M-6 Data Science and Artificial Intelligence</u>						
<u>Introduction to Data Science</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Artificial Intelligence Fundamentals</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>M-7 Algorithms and Data Structures</u>						
<u>Algorithms and Data Structures</u>	<u>9</u>	<u>2</u>		<u>4</u>		
<u>Professional Practice</u>	<u>4</u>					
<u>M-8 Databases and Data Security</u>						
<u>Database Theory</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Data Security</u>	<u>6</u>	<u>2</u>		<u>2</u>		

0 Appendix: Programme Learning Outcomes and Curricula

<u>Professional Practice</u>	<u>3</u>					
<i>M-9 Deep Learning</i>						
<u>Deep Learning</u>	<u>6</u>	<u>2</u>	<u>2</u>			
<u>Professional Practice</u>	<u>9</u>					
<i>ELECTIVE COMPONENT</i>						
<u>Business Process Management & Data Analysis</u>	<u>6</u>					
<u>Natural Language Processing (NLP)</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Stat Computing & Data Analysis</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<i>M-10 Business Intelligence and Big Data Modeling</i>						
<u>Big Data Modeling</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Business Intelligence Tools</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Applied Data Science</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<i>M-10 Blockchain Technology & Database Management</i>						
<u>Blockchain Technology</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Database Management</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Big Data Ecosystems</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<i>M-11 Operations Research and Data Mining</i>						
<u>Data Mining</u>	<u>9</u>	<u>2</u>		<u>4</u>		
<u>Operations Research and Optimization Methods</u>	<u>9</u>	<u>2</u>	<u>4</u>			
<u>Machine Learning</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<i>M-12 Business Analytics and Data Visualization</i>						
<u>Business Analytics and Data Visualization</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>Pre-diploma practice</u>	<u>3</u>					
<i>M-13 Predictive Analytics and Cloud Computing</i>						
<u>Models and Methods of Practical Predictive Analytics</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Cloud Computing</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Recommendation Systems</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<i>M-13 Software Engineering and Parallel Computing</i>						
<u>Design and Construction of Software</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Monitoring of Banking Processes</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Parallel Computing for Data Science</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<i>M-13 Cloud Applications and Search Engines</i>						
<u>Cloud Data Warehouses</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Search Engines</u>	<u>9</u>	<u>2</u>	<u>2</u>	<u>2</u>		
<u>Python Project for Data Engineering</u>	<u>6</u>	<u>2</u>		<u>2</u>		
<u>FINAL ATTESTATION</u>						
<u>TOTAL</u>						

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master's degree programme IT Management:

- “LO 1. Conduct a comprehensive analysis of the digital infrastructure of the organization to assess the effectiveness of information resources, conduct a comprehensive audit of the Information Systems, its digital component in order to assess the possibilities of integrating new developments and technical solutions into it.
- LO 2. Predict the effectiveness of innovation in the digital infrastructure of the organization based on a comprehensive statistical analysis of data about the managed object.
- LO 3. Design a comprehensive financial management strategy of the organization and its compatibility with the company's development strategy in order to ensure the company's competitiveness in the long term, interpret and generalize it in accordance with the industry specifics of the managed object.
- LO 4. Assess the implemented technical solutions to improve the efficiency of production business processes and compare them with the cost of their implementation costs.
- LO 5. Depending on the developed financial management strategy, plan a sound policy of working with external agents of the enterprise, such as banks, the public sector, tax authorities, investment and venture funds, as well as evaluate the possibility of participating in government support programs.
- LO 6. Differentiate and classify methods and tools for identifying, identifying and managing negative scenarios for processes or projects implemented in the company. Predict the size and probability of damage, methods of neutralizing them, and compare them with the cost of reducing or preventing them.
- LO 7. Use data mining methods and tools to gain the knowledge needed to make decisions and improve business processes.
- LO 8. To develop the field of information and communication technologies by conducting theoretical and experimental research, through the integration of knowledge from existing areas of ICT, new or interdisciplinary fields, and taking into account philosophical, historical, linguistic, psychological considerations.
- LO 9. Document the process and the result of scientific research in accordance with the standards and regulations for the maintenance of scientific research documentation, if necessary, using English as a means of communication in professional and scientific activities.
- LO 10. Determine the content, methods and means of training sessions in accordance with the objectives of the course for the development of the educational and

methodological complex of the discipline and the implementation of educational activities based on psychological and pedagogical principles.”

The following **curriculum** is presented:

Module/Disciplines	ECTS	Workload HPW (Часы в неделю)				Term
		lec.	sem.	lab.	other	
Module on history and philosophy of science	12					
History and philosophy of science	3	1.5	1.5			1
Foreign Language (professional)	6		6			2
Psychology and Pedagogy Module	11					
Pedagogy of higher education	3	1.5	1.5			1
Management Psychology	3	1.5	1.5			2
Teaching Internship	5		5			2
Corporate management of enterprise resources and risks	12					
Information technology in financial management	6	3		3		1
Information technologies of risk management	9	3		6		2
Corporate IS	15					
IT Management in companies	6	3		3		1
Strategic Information Systems Management	9	3		6		2
Researches in IS	18					
Organization and planning of scientific researches (English)	6	3		3		1
Analysis, modeling and design of IS	6	3		3		1
Project and Change Management	6	3		3		2
Enterprise digital infrastructure management	13					
Digital marketing information technologies	9	3		6		3
Research practice	4				4	3
Enterprise strategy and innovation management	18					
Management of startups and innovations	9	3		6		3
Models and methods in strategic management	9	3		6		3
Business Analytics and Operational Management	18					
Operational Management	9	3	6			3
Business intelligence systems	9	3	6			3
RESEARCH PRACTICE						
MASTER'S STUDENT RESEARCH (MSR), INCLUDING SCIENTIFING INTERNSHIP AND DISSERTATION WRITING	24					
MSR1 Research Seminar	3	1	1		1	1, 2, 4
MSR2 Dissertation Writing	14	2	3	2	7	1-4
MSR3 Scientific Internship	3				3	4
MSR4 Publication in the Proceedings of International Conferences	4				4	4
<u>FINAL ATTESTATION</u>	12				12	4
TOTAL	141					

According to the Self-Assessment Report, the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD programme Artificial Intelligence in Medicine:

- “LO 1. Build mathematical models of various tasks of creating a public good, determine a methodology for applying artificial intelligence methods to them, set quality assessment criteria, develop general data models and organize data exchange based on cloud computing in order to increase the likelihood of socially beneficial results.
- LO 2. Compare and select digital signal processing algorithms for various medical applications, evaluate experimental results and correlate them with appropriate design and programming methods, implement digital signal processing algorithms and design methods on embedded devices.
- LO 3. Perform the main stages of preparing medical imaging data when developing artificial intelligence algorithms, explain the current limitations for data processing, and explore new approaches to solving data accessibility problems.
- LO 4. Apply machine learning methods for medical diagnostics and analytics based on medical data, create tools for data mining.
- LO 5. Evaluate how embedded systems, artificial intelligence tools for medical care can be used to identify and assess the health effects of behavioral and environmental factors.
- LO 6. Draw up research programs, apply research methods, carry out scientific management of research on the most important scientific problems of a fundamental and applied nature, obtain the necessary data from scientific and technical documents, reports and other reference materials.
- LO 7. Conduct teaching activities in higher education institutions, introduce advanced and innovative teaching technologies, develop educational and methodological support for new courses, taking into account the social modernization of Kazakhstan and the development of the national economy.
- LO 8. To contribute in the framework of original studies that expand the boundaries of knowledge through the use of artificial intelligence in medicine, use the academic style of writing, publish research results in the form of scientific articles in Kazakh and foreign publications, be prepared for correct and tolerant interaction in society, for social interaction and cooperation to solve scientific and technical problems.”

The following **curriculum** is presented:

Module/Disciplines	ECTS	Workload HPW				Term
		lec.	sem.	lab.	other	
M-1 Scientific-Research tools	15					
<i>Academic writing</i>	2	0	18	0	42	60
<i>Scientific Research methods</i>	3	15	15	0	40	90
TEACHING INTERSHIP	10					
Elective components	5					
M-2 Deep Learning for Medical Imaging		15	30	0	105	150
<i>Deep Learning for Medical Imaging</i>		15	30	0	105	150
M-2 Applied Electrical and Electronic Engineering for Medicine						
<i>Applied Electrical and Electronic Engineering for Medicine</i>		15	30	0	105	150
M-3 Artificial Intelligence and signal processing	10					
<i>Artificial Intelligence for Social Good</i>		15	30	0	105	150
<i>Advanced Digital Signal Processing</i>		15	30	0	105	150
Elective components	5					
M-4 Machine Learning for Medical Diagnosis						
<i>Machine Learning for Medical Diagnosis</i>		15	30	0	105	150
M-4 Embedded systems and their applications in healthcare						
<i>Embedded systems and their applications in healthcare</i>		15	30	0	105	150
RESEARCH						
RESEARCH PRACTICE	10		90		15	
Participation in international scientific conferences	6					180
Publication of the main scientific results of the dissertation in scientific journals	15					450
Scientific Internship	10					300
Research Seminar	33					780
The implementation of a Doctoral Thesis	59					1770
FINAL ATTESTATION	12					360
Total	180					