



ASIIN Seal & EURO-Inf[®] Label

Accreditation Report

Bachelor's Degree Programme

Computer Science

Computer Security

Hardware Security

Network Security

Master's Degree Programme

Data Science

PhD Programme

Data Science

Provided by

**International Information Technology University,
Almaty**

Version: 26 September 2025

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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
6B06101 Компьютерлік ғылымдар	6B06101 Computer science	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
6B06112 Data science	6B06112 Data science	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
6B06301 Компьютерлік қауіпсіздік	6B06301 Computer security	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
6B06302 Ақпаратты қорғаудың Аппараттық құралдары	6B06302 Hardware security	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
6B06303 Желілік қауіпсіздік	6B06303 Network security	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
7M06106 Деректер ғылымы	7M06106 Data Science	ASIIN, Euro-Inf® Label	ASIIN, 07.12.2018 – 30.09.2024	04
8D06105 Деректер ғылымы	8D06105 Data Science	ASIIN	IAAR, 13.11.2020 – 13.11.2025	04
Date of the contract: 03.06.2024 Submission of the final version of the self-assessment report: 19.12.2024 Date of the onsite visit: 08.-10.04.2025				

¹ ASIIN Seal for degree programmes; Euro-Inf®: Label European Label for Informatics

² TC 04 - Informatics/Computer Science.

at: IITU Almaty	
Expert panel: Prof. Dr. Thomas Götz, University of Koblenz Prof. Dr. Reimar Hofmann, Karlsruhe University of Applied Sciences Prof. Dr. Konstantin Knorr, Trier University of Applied Sciences Aziza Shuzheyeva, Head of the Digital Transformation Foundation Dina Kengesbay, Student at SDU 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 March 28, 2023 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
6B06101 Computer science	Ақпараттық-коммуникациялық технологиялар саласының бакалавры / Bachelor of Information and Communication Technology	Software development, Telecommunication systems, Web application development, Mobile application development, Big data and Data science, Machine learning	6	Full time	-	8 Semester	240 ECTS	September 2019
6B06112 Data science	Ақпараттық-коммуникациялық технологиялар саласының бакалавры / Bachelor of Information and Communication Technology	Data analysis and visualization, Machine learning, Big data, Neural networks and Deep learning, Optimization and operations research, Advanced mathematics for Data science, Python programming for Data science, Data-driven decision making	6	Full time	-	8 Semester	240 ECTS	September 2019
6B06301 Computer security	Ақпараттық-коммуникациялық технологиялар саласының бакалавры / Bachelor of Information and Communication Technology	Information Security, Cryptography, Cybersecurity Risk Management, Ethical Hacking, Cloud Security, Incident Response	6	Full time	-	8 Semester	240 ECTS	September 2019

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
6B06302 Hardware security	Ақпараттық-коммуникациялық технологиялар саласының бакалавры / Bachelor of Information and Communication Technology	Chip Security, Firmware Security, Physical Security, Secure Boot, Hardware Cryptography, Tamper Resistance, Side-Channel Attack Protection	6	Full time	-	8 Semester	240 ECTS	September 2019
6B06303 Network security	Ақпараттық-коммуникациялық технологиялар саласының бакалавры / Bachelor of Information and Communication Technology	Network Security, Firewall Management, Intrusion Detection, Intrusion Prevention, VPN Security, Wireless Security, Network Encryption, Secure Routing, DDoS Protection, Network Monitoring	6	Full time	-	8 Semester	240 ECTS	September 2019
7M06106 Data Science	Техника ғылымдарының магистрі / Master of technical sciences	Machine learning, Deep learning and Neural networks, Big data and Data analytics, Mathematical modelling, Optimization methods, Bayesian statistics and analysis, Python/R for Data analysis	7	Full time	-	4 Semester	120 ECTS	September 2019
8D06105 Data Science	Философия докторы PhD / Doctor of Philosophy PhD	Machine learning, Deep learning, Big data analytics, Statistical methods and optimization, Mathematical modelling, Applied statistical analysis	8	Full time	-	6 Semester	180 ECTS	September 2020

The International Information Technology University Almaty (IITU) is a Kazakh public university for specialized IT-related education founded in 2009. The university is based on an international profile stemming from close collaborations with IT-specialized universities among others in the US, Korea, China, Russia, England, Switzerland, Germany and Lithuania, as well as cooperations with global info-communication companies, including

Microsoft and Cisco. It offers 27 undergraduate degree programmes, 11 Master's degree programmes, and 5 Doctoral degree programmes, hosting a total of about 5,000 active students. The portfolio of study programmes focuses on the following general competences and qualifications of graduates:

- Developing innovative digital solutions
- Operating and deploying advanced IT systems
- Applying digital technologies across diverse industries
- Managing digital transformation projects effectively

Consistent with the international education approach, the instruction language in all programmes under review is English. IITU is considered one of the top 3 universities of Kazakhstan and ranks among the top 50 universities in Central Asia according to the 2025 Asian University Rankings. All programmes under review are offered by the Faculty of business, media and management.

For the Bachelor's degree programme Computer Science the institution has presented the following profile in the programme's passport:

„Computer science is a scientific field that studies the laws, methods and methods of obtaining, storing, transmitting and processing information in various fields of human activity using computer technology and telecommunications systems.

Training of a specialist in this experimental program involves the formation of certain professional competencies, including knowledge and skills in the design and evaluation of algorithms and application software interfaces; development and analysis of interacting processes in information environments; development, operation and maintenance of software systems for computers, computer networks and communication tools; identification of new areas of application of computer systems and design of software for them, etc. Graduate training in the experimental program 'Computer science' provides a professional qualification:

- Software development specialist
- Information technology specialist for telecommunications systems
- Specialist in computer design and Web application development
- Specialist in mobile app development and promotion
- Specialist in processing, analyzing and storing large data sets, so-called "BigData" (DataScientist)
- Machine learning specialist

The objects of professional activity are mathematical and software of computers, computer networks and communication tools, mathematical models of processes and systems. Our approach involves both covering the basic skills of the EP 'Computer science', and through the possibility of elective subjects covering the necessary elements of training in the direction of 'Computer science'. At the same time, the student is left with the option of taking additional subjects at his discretion as free electives - these can be subjects from any specialty. "

For the Bachelor's degree programme Data Science the institution has presented the following profile in the programme's passport:

"The need for the emergence of such a profession was dictated by the fact that when we deal with Ultra Big Data, the data arrays turn out to be too large to be processed by standard means of mathematical statistics. Every day, thousands of petabytes (10¹⁵ bytes = 1024 terabytes) of information pass through the servers of companies around the world. In addition to such volumes of data, the problem is complicated by their heterogeneity and high update speed.

A data scientist, like a real scientist, not only collects and analyzes data, but also studies it in different contexts and from different angles, questioning any assumptions. The most important quality of a data scientist is the ability to see logical connections in the system of collected information and, based on quantitative analysis, develop effective business solutions. In today's competitive and rapidly changing world, in the ever-growing flow of information, a Data Scientist is indispensable for management in terms of making the right business decisions. Individually, a statistician, systems analyst or business analyst cannot solve problems with such volumes of data. This requires a person with an interdisciplinary education, competent in mathematics and statistics, economics and business, computer science and computer technology.

The main task of a Data Scientist is the ability to extract the necessary information from a wide variety of sources, using information flows in real time; identify hidden patterns in data sets and statistically analyze them to make smart business decisions. The workplace of such a specialist is not 1 computer or even 1 server, but a cluster of servers.

Our approach involves both covering the basic skills of the MCM specialty, and through the possibility of elective subjects, covering the necessary elements of training in the field of "Data science". At the same time, the student is left with the opportunity to take additional subjects at his discretion as free electives (minors) - these can be subjects from any specialty."

For the Bachelor's degree programme Computer Security the institution has presented the following profile on its website:

„The program is designed to implement the principles of democratic education management, expanding the boundaries of academic freedom and authority of educational institutions, which will ensure the training of elite, highly motivated staff for innovative and knowledge-intensive sectors of the economy.

The educational program provides an individual approach to students, ensures the transformation of professional competences from professional and qualification standards to learning outcomes. Student-centered learning is provided – the principle of education which assumes a shift of emphasis in the educational process from teaching (as the main role of the teaching staff in the "transmission" of knowledge) to learning (as an active educational activity of the student).

The educational program "Computer security" provides practice-oriented training of graduates in the field of creation, use and protection of information technologies intended for work in various industries and in business.

A computer security specialist is an employee engaged in providing computer security at the enterprise. The main activity of a computer security specialist is related to protecting computer systems and means of processing, storing and transmitting information; information security services; mathematical models of processes that occur in data protection.”

For the Bachelor's degree programme Hardware Security the institution has presented the following profile on its website:

“The educational program "Hardware means of data protection" is designed to provide practice-oriented training of graduates in the field of protection of critical information circulating in information systems from unauthorized access, including the use of methods and means of cryptographic data protection intended for work in various industries and businesses.

A specialist in the field of hardware means of data protection is an employee engaged in the development, implementation and maintenance of the technical section of the information security system at the enterprise. The main activity of the specialist in the field of hardware means of data protection is related to securing computing systems and technical means of processing, storing and transmitting information; delivery of information security services; creation of mathematical models of processes involved in the protection of information.”

For the Bachelor's degree programme Network Security the institution has presented the following profile on its website:

"The purpose of the program is to train qualified competitive specialists in the field of network security, which is associated with the creation of a protection system for specific enterprises and protection of local computer networks from virus attacks or hackers. Network security specialists prevent the leakage of important information, data fraud and incompetence (malicious intent) of employees. On a national scale, network and information security specialists create systems for protecting strategic information on the country's defense capability.

The "Network Security" academic program is dedicated to teaching students the theory and practice of protection at the junction of two areas: network information technologies and security technologies. Today neither commercial structures nor departmental organizations can work without network security officers.

The responsibilities of Network Security specialists include:

- protection of internal networks from unauthorized access;
- provision of a secure connection to the Internet and secure remote access;
- control over the operation of various online applications through which hackers can get access to personal computers;
- provision of the ability to carry out commercial transactions via the Internet."

For the Master's degree programme Data Science the institution has presented the following profile in the programme's passport:

"Data Science is the science of techniques for analysing data and extracting valuable information, knowledge from it. It closely overlaps with such fields as Machine Learning (Machine Learning) and Cognitive Science (Cognitive Science and, of course, technologies for working with big data (Big Data). During the time of massive proliferation of technology, man has generated a huge amount of data. This is big data, Big Data. And it is possible to get a lot of benefit out of it if it is processed properly. The aim of the educational programme "Data Science" is for master students to study machine learning, deep learning and neural networks. The objectives of the educational programme 'Data Science' are:

- Obtaining by master students a good training in databases.
- Mastering by master students of machine learning methods.
- Studying the basic methods of deep learning.
- Obtaining skills of working with neural networks"

For the Doctoral degree programme Data Science the institution has presented the following profile in the programme's passport:

"Data Science is the science of methods for analysing data and extracting valuable information and knowledge from it. It closely overlaps with such fields as Machine Learning and Cognitive Science and, of course, technologies for working with big data (Big Data).

Nowadays, major players in the economic world are becoming increasingly aware of the potential of their data. They are constantly looking for ways to utilise their data and extract as much useful information from it as possible. The role of data scientists is to help companies in this task by acquiring, storing, organising and processing this mass of information to extract value. A data science and artificial intelligence professional must have interdisciplinary skills ranging from a deep knowledge of maths and statistics to mastering the IT tools and infrastructure required to manage and process data. In addition, research scientists should have curiosity and a thirst to understand the application area in which they are working.

The aim of the educational programme is to prepare PhD doctors to become leaders in the field of data science research and to help them develop the research skills necessary for a career in academia or industry.

Objectives of the educational programme:

- Develop a deep understanding of key technologies in data science and business intelligence: data mining, machine learning, visualisation techniques, predictive modelling and statistics.
- Practise problem analysis and decision making.
- Gain hands-on experience with statistical programming languages and big data tools through research papers.
- Gain skills in working with neural networks."

C Expert Report for the ASIIN Seal⁴

1. The Degree Programme: Concept, Content & Implementation

Criterion 1.1 Objectives and Learning Outcomes of a Degree Programme (Intended Qualifications Profile)

Evidence:

- Self-Assessment Report
- Programme Passports of each degree programme
- Module handbook of each degree programme
- Objective-module-matrix for each degree programme
- Diploma Supplement for each degree programme
- Faculty website
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The experts base their assessment of the learning outcomes on the information provided in the module descriptions, the so-called programmes' passports, the programmes' websites and in the Self-Assessment Report of the seven degree programmes under review. For each degree programme, IITU has described programme objectives, learning outcomes (LO), intended basic and field-specific competencies and exemplary qualification profiles. A short description of each programme, their main subjects, aims and objectives as well as their qualification profiles are published on the faculties' websites and easily accessible for students as well as other stakeholders. Furthermore, there are regular revision processes in place that take into account feedback by external and internal stakeholders.

The experts refer to the Subject-Specific Criteria (SSC) of the Technical Committee Informatics/Computer Science and use the objective-module-matrices and module descriptions

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

for each programme as a basis for judging whether the intended learning outcomes correspond with the competences as outlined by the SSC.

The experts note that the relationship between programme objectives and learning outcomes has been established in a comprehensible and logical manner. The development of these objectives and outcomes for each study programme under review involves both internal and external stakeholders so that the curricula can be adapted and modified according to the needs of the industry and the graduates on a regular basis. For example, IITU regularly conducts surveys, through which the different stakeholders get the chance to assess the programmes and their main objectives and adapt them if necessary. Internal stakeholders include all of IITU members (students, teaching staff, and non-academic employees), while the external stakeholders include the industry, alumni, the government, and society. During the audit discussions, the programme coordinators report that the programme passports, and thus the curricula, are modified by at least 30% every three years, taking into account feedback from relevant stakeholders.

For the Bachelor degree programme in Computer Science, IITU sums up the programme's objectives and lists the corresponding learning outcomes in its Self-Assessment report as follows:

"The program aims to foster strong analytical, critical thinking, and practical skills for careers in software development, systems analysis, and related fields. To provide students with a comprehensive foundation in computing principles, programming, and system design, equipping them to develop software solutions and solve complex technological problems.

Upon completion of a BA in Computer science, students will be able to:

- LO1. Apply knowledge to develop systems and create models for process optimization.
- LO2. Apply knowledge to solve practical problems using mathematical and physical methods.
- LO3. Develop and test software using modern programming languages and algorithms.
- LO4. Use analytical skills to understand processes and communicate in a foreign language.
- LO5. Manage network infrastructures and configure their security.
- LO6. Design and test software using modern tools.
- LO7. Possess knowledge of data analysis methods and skills in visualization for decisionmaking."

In the programme's passport, IITU describes that graduates of the Bachelor's degree Computer Science can work as Software development specialist, Information Technology specialist for telecommunication systems, Specialist in computer design and Web application development, Specialist in mobile app development and promotion, Specialist in processing, analyzing and storing large data sets (DataScientist) and Machine learning specialist.

For the Bachelor degree programme in Data Science, IITU sums up the programme's objectives and lists the corresponding learning outcomes in its Self-Assessment report as follows:

"The objective of the Data Science DP is to provide foundational knowledge and practical skills in data analysis, statistical methods, programming, and data visualization. The program aims to prepare graduates for entry-level roles in data-driven industries and equip them with the ability to understand and solve basic data science problems.

Upon completion of a BA in Data science, students will be able to:

- LO1. Apply mathematical and physical methods to solve practical problems.
- LO2. Develop, optimize, and test software using modern programming languages and algorithms.
- LO3. Use analytical skills, understand social processes, and communicate effectively in a foreign language.
- LO4. Collect, process, and analyze data, utilizing visualization tools for decision-making.
- LO5. Use machine learning methods to develop and implement models for data analysis.
- LO6. Design and test software, applying programming languages and development tools to create applications."

In the programme's passport, IITU describes that graduates of the Bachelor's degree Data Science can take up occupation in "[enterprises] and organizations of various forms of ownership that use large amounts of data in digital form, requiring their structuring and analysis to solve production and management problems" or in "scientific institutes and organizations developing, implementing and operating intelligent systems for predicting new results and making recommendations to optimize various processes and production."

For the Bachelor degree programme in Computer Security, IITU sums up the programme's objectives and lists the corresponding learning outcomes in its Self-Assessment report as follows:

"The purpose of the Computer Security program is to provide practice-oriented training for graduates in the development, application, and protection of information technologies, with a focus on safeguarding data from external and internal threats, tailored for work across various industries and businesses.

Computer security program's objectives:

1. Prepare graduates for professional activities in the field of protecting applications and programs from modifications.
2. To meet the needs of the market with computer security specialists.
3. Create conditions for continuous professional self-improvement.
4. Create conditions for the development of social and personal qualities of graduates (purposefulness, organization, diligence, communication skills, ability to work in a team, responsibility for the final result of their professional activities, civic responsibility, tolerance), social mobility and competitiveness in the labor market.

Upon completion of a BA in Computer security, students will be able to:

- LO1: Utilize mathematical and physical methods to solve practical problems effectively.
- LO2: Design, test, and optimize hardware systems to address engineering challenges, ensuring the protection of data from external and internal threats.
- LO3: Develop and evaluate software solutions using contemporary programming languages and algorithms, incorporating mechanisms to safeguard data against external and internal risks.
- LO4: Apply analytical thinking and communicate proficiently in a foreign language.
- LO5: Manage and secure network infrastructures to ensure their reliability and resilience.
- LO6: Identify vulnerabilities, perform penetration testing, and devise comprehensive protection strategies.
- LO7: Leverage knowledge of cyber threats to develop robust measures for system security, ensuring the protection of data from external and internal threats."

In the programme's passport, IITU describes that graduates of the Bachelor's degree Computer Security can work as computer security specialist, whose "main activity [...] is related to secure computer systems and means of processing, storing and transmitting

information; information security services; mathematical models of processes arising in the process of information protection.”

For the Bachelor degree programme in Hardware Security, IITU sums up the programme’s objectives and lists the corresponding learning outcomes in its Self-Assessment report as follows:

“The purpose of the DP is to train highly qualified specialists in information security for innovative industries, focusing on hardware-based protection to minimize data leakage risks, while meeting global market demands and driving advancements in the field.

Upon completion of a BA in Hardware security, students will be able to:

- LO1: Apply mathematical and physical methods to effectively solve practical problems.
- LO2: Develop and optimize hardware systems with integrated software-hardware protection to reduce data leakage risks.
- LO3: Create and test software with modern tools, ensuring data security through software hardware protection.
- LO4: Utilize analytical skills and communicate proficiently in a foreign language.
- LO5: Manage and secure network infrastructures to ensure their stability.”

In the programme’s passport, IITU describes that “Specialist in the field of information security hardware [is] an employee involved in the development, implementation and maintenance of the technical section of the information security system at the enterprise. The main activity of a specialist in the field of information security hardware is related to secure computing systems and technical means for processing, storing and transmitting information; information security services; mathematical models of processes arising in the process of information protection.”

For the Bachelor degree programme in Network Security, IITU sums up the programme’s objectives and lists the corresponding learning outcomes in its Self-Assessment report as follows:

“The purpose of the DP is to train highly qualified specialists in enterprise information security audit, with competencies in protecting local networks from virus attacks and hacking, while fostering professional growth.

Upon completion of a BA in Network security, students will be able to:

- LO1: Apply mathematical and physical methods to solve practical problems.
- LO2: Develop, test, and optimize hardware systems for engineering tasks, ensuring protection of local networks from virus attacks and hacker intrusions.
- LO3: Develop and test software using modern programming languages and algorithms, incorporating mechanisms to safeguard cyber threats.
- LO4: Apply analytical skills and communicate effectively in a foreign language.
- LO5: Design, configure, and manage network infrastructures, ensuring their security and protecting local networks from virus attacks and hacker intrusions.
- LO6: Analyze threats, monitor security, and develop recommendations for responding to cyberattacks.
- LO7: Ensure the security of web applications, analyze vulnerabilities, and develop data protection strategies.”

Regarding the three Bachelor’s degree programmes in the field of security, IITU further explains in its Self-Assessment report, that “[these] degree programs have been coordinated with the Kazakhstan Association of Information Security (KAIB) and the National Innovation Center [...]. The curriculum of these degree programs is updated annually, as faculty members of the department participate in various cybersecurity-related events and meet with many industry representatives who provide their recommendations.”

For the Master degree programme in Data Science, IITU defines the following educational programme learning outcomes in the programme’s passport:

- “LO1: Argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and tools for building information security systems of modern ICT.
- LO2: Apply mathematical models and methods of various processes
- LO3: Create mathematical models using the methods of modern information technologies.
- LO4: Build a mathematical model of energy problems
- LO5: Develop and / or use software, hardware, information, mathematical, and functional support for information systems, including algorithms and methods of information security
- LO6: Demonstrate communication skills, initiative and psychological preparedness for work, including when working in a team and to make managerial and technical decisions
- LO7: Build 3D visualizations

- LO8: Extract the desired information from various sources, including information flows in real time
- LO9: Apply research methodology in the field of data science
- LO10: Solve applied problems of data processing and analysis in order to identify hidden dependencies in them
- LO11: Carry out a comprehensive analysis and analytically summarize the results of scientific research using modern achievements of science and technology, skills of independent data collection, study, analysis and generalization.”

For the PhD programme in Data Science, IITU sums up the programme’s objectives its learning outcomes in its Self-Assessment report as follows:

“The purpose of ‘Data Science’ PhD DP is to cultivate researchers capable of developing new theories, methodologies, and applications in data science. The program emphasizes original research, critical analysis, and thought leadership to advance the frontiers of data science.

Upon completion of a PhD in Data science, students will be able to:

- LO1. Conduct independent research, analyze data, and develop new theories in your field.
- LO2. Develop and implement models to solve complex problems using modern algorithms and frameworks.
- LO3. Develop and optimize complex machine learning algorithms for analyzing large volumes of data and implement them in practical applications.”

In the experts’ opinion, the intended qualification profiles of all seven programmes under review are generally clear, plausible and allow students to take up an occupation, which corresponds to their qualification. They learn that the graduates of IITU are much sought after in the labor market. The representatives of industry emphasize the high quality of the graduates of the programmes under review. They emphasize positively that IITU graduates already have good skills and sufficient knowledge and, above all, stand out because they can adapt quickly to a new environment and new circumstances. Therefore, they are very satisfied with the graduates overall. Furthermore, students as well as graduates also state that they are satisfied with and well aware of their good job perspectives. In general, a high employment rate among graduates can be demonstrated to experts, which underlines that IITU graduates are well received by the industry.

However, even though industry representatives state in the audit discussions that they are generally satisfied with the graduates and the individual cooperation with IITU, they would like to strengthen systematic exchange between the industry and the university. They describe how much currently happens through personal contacts. For example, one representative reports that feedback from his company led to the introduction of a new module, which in turn resulted in three students completing an internship at his company after taking the course. In general, the university itself shows a high level of interest in exchanging ideas and establishing links with industry. However, the industry representatives also note that exchanges often require a lot of agreements and involve a great deal of bureaucracy that there is no established system for regular exchange on a higher level, e.g. through an advisory board or similar. They would like to have more regular, systematic meetings to discuss the further development of the programmes and not just to exchange ideas when, for example, an internship is at stake. Therefore, they would like to see further work on expanding systematic exchange, for example when it comes to the latest developments in the industry and how the curriculum should be adapted accordingly, but also when it comes to internship positions. Although they state that in general, they are already satisfied with the level of individual cooperation at the moment, they believe that the exchange could be raised to a higher/more systematic level.

The experts acknowledge that the university does conduct surveys of industry in order to further develop its degree programmes and that there is an exchange between IITU and industry on many levels, whether through personal contacts or contacts that arise, for example, after jointly organised internships. Nevertheless, they understand the industry's wish for stronger and, above all, more systematic cooperation and want to support this with a corresponding recommendation. Therefore, the experts recommend to strengthen the cooperation with industry, especially regarding the establishment of a systematic and regular exchange. The experts emphasise that Almaty has a large IT infrastructure and industry, which should be integrated accordingly.

In summary, the experts confirm that all seven degree programmes under review adequately reflect EQF 6 level (Bachelor's programmes), EQF 7 level (Master's programmes), and EQF 8 level (PhD programme) respectively. This can also be confirmed based on the module descriptions and discussions. The learning outcomes are consistent with the ASIIN Subject-Specific Criteria of the Technical Committees 04. They aim at the acquisition of specific competences and are well-anchored and binding.

Criterion 1.2 Name of the Degree Programme

Evidence:

- Self-Assessment Report
- Programme Passport of each degree programme
- Diploma Supplement for each degree programme
- National regulation: “RK Classifier of Higher and Postgraduate Education”

Preliminary assessment and analysis of the experts:

As explained in the Self-Assessment Report, the names of all programmes under review were chosen in accordance with the “RK Classifier of Higher and Postgraduate Education” as mandated by the Kazakh Ministry of Science and Higher Education and Science. Besides the designated programme names, an alphanumerical code is part of the official programme title which uniquely identifies the programmes and matches them with a national classification of subjects and study fields. Although all programmes are taught fully in English according to the university, the programmes still have original Kazakh names which is also due to the national regulations. This does not seem intuitive to the experts but is not considered problematic.

For the four undergraduate programmes IITU awards the degree title of “Bachelor of Information and Communication Technology”, the degree title of the Master’s degree programme Data Science is “Master of Technical Sciences” and graduates of the doctoral programme Data Science are awarded the degree of “Doctor of Philosophy”.

The experts are generally satisfied with the titles of all seven programmes under review and confirm that the titles correspond with the intended aims and learning outcomes. However, the experts note that the same title is not always used for the Bachelor Hardware Security. For example, it is referred to as “Hardware means of data protection” on the website, while a different name is used in slides from a presentation given during the audit. When asked, those responsible confirm that “Hardware Security” is the correct name. The experts note that consistency must be established between the official and published names. Following the audit, the IITU updates its website, which now also uses Hardware Security as the designation. In the experts' opinion, this now ensures consistency.

In summary, the experts confirm that both the Kazakh as well as the English programme names and degree titles correspond with their intended objectives and learning outcomes. They are now used consistently across all official documents as well as the university’s websites.

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report
- Programme passport of each degree programme
- Module handbook of each degree programme
- Objective-module-matrix for each degree programme
- Diploma Supplement for each degree programme
- Student handbooks
- Faculty website
- Discussions during the audit

Preliminary assessment and analysis of the experts:

Structure and Content of the programmes

The curricula of all seven study programmes under consideration are reviewed by the experts in order to identify whether the described learning outcomes (see chapter 1.1) can be achieved by the available modules. Course descriptions as well as overviews and the objective-module-matrices matching the different LOs and the various module contents were provided for a thorough analysis.

The curricula of the four Bachelor's degree programmes are designed for 8 semesters and offered as full-time study programme. To complete the programmes, students must complete at least 240 ECTS credits. The curriculum of the Master's degree programme Data Science is designed for 4 semesters in which students have to reach at least 120 ECTS credits and is offered as a full-time study programme. The PhD programme Data Science is designed for 6 semesters including 180 ECTS credits and is offered as a full-time study programme as well.

In its Self-Assessment report, IITU explains the general development, approach and structure of the curricula as follows: All programmes “are designed to meet the needs of modern society and the labor market. [...] When developing the curriculum for DPs, the opinions of all stakeholders are considered, and LO are aligned with course outcomes, contributing to the achievement of the specified competence package. Changes were made to the elective courses section based on labor market demand and recommendations from the Educational and methodological associations of the Republican Educational and Methodical Council. Professional internship is organized in accordance with the Procedure for

Organizing Professional Practice for Students, and the ECTS of professional practices is aligned with the SCES. [...] The list of courses retains prerequisites and post-requisites, allowing students to gradually study relevant courses. If certain courses no longer align with the overall concept, they are reviewed, and a decision is made collectively whether to modify or remove the course from the curriculum. A comparative analysis is conducted to ensure that core courses meet the requirements, and based on this, the program coordinator determines the program's integrity and its alignment with the corresponding level of preparation. Elective courses are designed to give students the opportunity to choose a direction that suits their interests, with each elective linked to a specific competency, ensuring that the overall LO learning outcomes remain achievable. In addition to the core degree programs, minor courses are offered to students as an opportunity to gain extra skills. These courses contribute to the overall assessment as part of Self-Directed Learning grades. For example, Coursera courses can be assigned by instructors as additional learning material, courses from Huawei Academy or Cisco Academy are also available, offering specialized skills. Each of these courses has its own grading system outlined in the syllabus. When calculating the overall semester grade, these minor courses are mandatory for inclusion in the evaluation process. Furthermore, minor courses are counted as part of the 240 credits required for degree completion and are reflected in the student transcript."

For the Bachelor's degree programmes Computer Science, IITU presents the following curriculum in its Self-Assessment report:

Computer Science 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Information and Communication Technologies	5		Political science	2
Discrete mathematics	6		Sociology	2
Algebra and Geometry	4		Physical Culture	4
Introduction to Programming	6		Physics	4
WEB technology	5		Mathematical analysis	6
			Educational practice	7
		Programming in Python	4	
credits 31			credits 29	
total for the 1st year = 60				
Term 3		year 2	Term 4	
Kazakh (Russian) language	5		Kazakh (Russian) language	5
Psychology	7		Algorithms and data structures	6
Cultural studies	2		Database theory	5
History of Kazakhstan	5		Professional Internship	4
Physical Culture	4		Computational mathematics	5
Object-oriented programming	7		Mathematical statistics for programmers	5
Design and administration in MS EXCEL	5			
credits 30			credits 30	
total for the 2nd year = 60				
Term 5		year 3	Term 6	
Fundamentals safety of life activity and ecology	5		Philosophy	5
Fundamentals of law and anti-corruption culture			PL/SQL programming	5
Startups and entrepreneurship			Data analysis and visualization in Power BI	5
Economic theory			Numerical methods of analysis and algebra	5
Research methodology			Application development in ASP.NET	5
Professionally oriented foreign language	4		Minor 2	5
Business correspondence in the state language	2		Professional Internship	4
Programming on Internet of Things (IOT)	5			
Minor 1	5			
Development of Web applications in Java Spring	5			
credits 26			credits 34	
total for the 3rd year = 60				
Term 7		year 4	Term 8	
Operation research	6		Pregraduation practice	5
Advanced WEB technology	5		Algorithmic aspects of machine learning	6
Advanced database theory	6		Human-computer interaction	5
Algorithm Design and Analysis	4		Parallel programming	
Minor 3	5		Amazon Web Services Foundations (AWS Foundations)	5
Exploratory data analysis	5		Development of mobile applications on IOS	
		Development of mobile applications on Android		
		Diploma Work (Project) and Defense	8	
credits 31			credits 29	
total for the 4th year = 60				

totally 240 credits

For the Bachelor's degree programmes Data Science, IITU presents the following curriculum in its Self-Assessment report:

Data Science 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Information and Communication Technologies	5		Physical Culture	4
Algebra and Geometry	4		Mathematical analysis 1	6
Introduction to Programming	6		Physics	4
WEB technology	6		Educational practice	2
Discrete Mathematics and Mathematical Logic	6		Programming in Python	4
			Probability Theory	3
credits	32		credits	28
total for the 1st year = 60				
Term 3		year 2	Term 4	
Kazakh (Russian) language	5		Kazakh (Russian) language	5
History of Kazakhstan	5		Political science	2
Physical Culture	4		Sociology	2
Object-oriented programming	7		Mathematical analysis 2	5
Differential Equations	5		Algorithms and data structures	6
			Computational mathematics	5
			Professional Internship	4
			Statistics for data analysis	5
credits	26	credits	34	
total for the 2nd year = 60				
Term 5		year 3	Term 6	
Psychology	2		Philosophy	5
Cultural studies	2		English for STEM	2
Research methodology			Machine Learning 1	5
Fundamentals safety of life activity and ecology			Advanced Mathematics for Machine Learning	5
Fundamentals of law and anti-corruption culture	5		Minor 2	5
Startups and entrepreneurship			Professional Internship	4
Economic theory			Numerical analysis	6
Professionally oriented foreign language	4			
Python for Data Analysis	5			
Database theory	5			
Minor 1	5			
credits	28		credits	32
total for the 3rd year = 60				
Term 7		year 4	Term 8	
Business correspondence in the state language	2		Pregraduation practice	5
Operation research	5		Data analysis and visualization in Power BI	3
Methods of nonlinear programming			Methods for solving inverse ill-posed problems	6
Deep learning for Applied Mathematics	5		Deep learning of inverse problems	
Machine learning 2	5		Neural Networks	6
Exploratory data analysis	5		Diploma Work (Project) and Defense	8
Optimal management	5			
Minor 3	5			
credits	32		credits	28
total for the 4th year = 60				
totally 240 credits				

totally 240 credits

For the Bachelor's degree programmes Computer Security, IITU presents the following curriculum in its Self-Assessment report:

Computer Security 2023-2027					
Term 1		year 1	Term 2		
Foreign language	5		Foreign language	5	
Kazakh (Russian) language	5		Kazakh (Russian) language	5	
History of Kazakhstan	5		Psychology	2	
Mathematical analysis	6		Information and Communication Technologies	5	
Legal Basics of Information Security	4		Cultural studies	2	
			Physical Culture	4	
			Algebra and Geometry	4	
			Algorithmization and Programming	6	
			Educational practice	2	
	credits 25			credits 35	
total for the 1st year = 60 credits					
Term 3		year 2	Term 4		
Political science	2		Professionally oriented foreign language	2	
Sociology	2		Web technologies	4	
Physical culture	4		Basics of the Linux operating system	4	
Physics	4		Switching, Routing, and Wireless Essentials	6	
Mathematical foundations of information security	6		Basic Circuit Theory	4	
Object-oriented programming (Java)	6		Business correspondence in the state language	2	
Computer Networking Basics	6		Industrial practice	4	
			Computer Information Protection Technologies	4	
	credits 30			credits 30	
total for the 2nd year = 60 credits					
Term 5			year 3	Term 6	
Philosophy	5	Project Management in Information Security		4	
Information Theory	4	Information recovery technologies			
Organization and architecture of computing systems	4	Introduction to Intelligent Cybersecurity		4	
Organization of database management systems	4	Security of operating systems		4	
Python programming language	4	Cryptographic methods of information security		4	
Introduction to Cybersecurity Incident Investigation	5	Corporate Cyber Security		4	
Minor 1	5	Industrial practice		4	
		Minor 2		5	
	credits 31			credits 29	
total for the 3rd year = 60 credits					
Term 7		year 4		Term 8	
Digital Forensics	5		Economics and Industrial Engineering		
Practical pentesting	6		Startups and entrepreneurship		
Protection of database management systems	5		Fundamentals of law and anti-corruption culture	5	
Introduction to Cloud	4		Fundamentals safety of life activity and ecology		
Mobile security technologies			Research methodology	2	
Identity and access management			Pre-graduate practice	5	
Development of corporate applications on the Django framework	6		Protection of applications and scripts from modifications		
Minor 3	5		DevNet	5	
			Blockchain technology		
			Cyber risk and cyber intelligence		
			Reverse Engineering	4	
			Diploma Work (Protect) and Defence	8	
	credits 31			credits 29	
total for the 4th year = 60 credits					

totally 240 credits

For the Bachelor's degree programmes Network Security, IITU presents the following curriculum in its Self-Assessment report:

Network Security 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Kazakh (Russian) language	5		Kazakh (Russian) language	5
History of Kazakhstan	5		Psychology	2
			Information and Communication Technologies	5
Mathematical analysis	6		Cultural studies	2
Legal Basics of Information Security	4		Physical Culture	4
			Algebra and Geometry	4
			Algorithmization and Programming	6
			Educational practice	3
credits 25			credits 35	
total for the 1st year = 60 credits				
Term 3		year 2	Term 4	
Political science	2		Professionally oriented foreign language	2
Sociology	2		Web technologies	4
Physical culture	4		Basics of the Linux operating system	4
			Switching, Routing, and Wireless Essentials	6
Physics	4		Basic Circuit Theory	4
Mathematical foundations of information security	6		Business correspondence in the state language	2
Object-oriented programming (Java)	6		Industrial practice	4
Computer Networking Basics	4		Computer Information Protection Technologies	4
credits 30				credits 30
total for the 2nd year = 60 credits				
Term 5		year 3	Term 6	
Philosophy	5		Project Management in Information Security	4
Information Theory	4		Network infrastructure security	
Organization of database management systems	4		Introduction to Intelligent Cybersecurity	4
Digital circuit design	4		Industrial practice	4
Python programming language	4		Security of operating systems	4
Enterprise Networks, Security, and Automation	5		Cryptographic methods of information security	4
Minor 1	5		Network Security	4
			Minor 2	5
credits 31				credits 29
total for the 3rd year = 60 credits				
Term 7		year 4	Term 8	
Practical pentesting	6		Fundamentals of safety of life activity and ecology	
WLAN Enterprise Technologies	6		Economics and Industrial Engineering	
Mobile security technologies	4		Startups and entrepreneurship	
Digital forensics of network infrastructure	4		Fundamentals of law and anti-corruption culture	5
Minor 3	5		Research methodology	2
Protection of database management systems	4		Pre-graduate practice	5
Introduction to Cloud			DevNet	
Development of corporate applications on the Django framework	6		Managing network infrastructure vulnerabilities	5
Intrusion detection and prevention systems			Blockchain technology	
		Network Interconnection		
		Analytics of Information Security Center	4	
		Diploma Work (Project) and Defence	8	
credits 31			credits 29	
total for the 4th year = 60 credits				

totally 240 credits

totally 240 credits

For the Bachelor's degree programmes Hardware Security, IITU presents the following curriculum in its Self-Assessment report:

Hardware Security 2023-2027			
Term 1		year 1	Term 2
Foreign language	5		Foreign language
Kazakh (Russian) language	5		Kazakh (Russian) language
History of Kazakhstan	5		Psychology
Mathematical analysis	6		Information and Communication Technologies
Legal Basics of Information Security	4		Cultural studies
			Physical Culture
			Algebra and Geometry
			Algorithmization and Programming
			Educational practice
	credits 25		credits 35
total for the 1st year = 60 credits			
Term 3		year 2	Term 4
Political science	2		Professionally oriented foreign language
Sociology	2		Web technologies
Physical culture	4		Basics of the Linux operating system
Physics	4		Switching, Routing, and Wireless Essentials
Mathematical foundations of information security	6		Basic Circuit Theory
Object-oriented programming (Java)	6		Business correspondence in the state language
Computer Networking Basics	6		Industrial practice
			Computer Information Protection Technologies
	credits 30		credits 30
total for the 2nd year = 60 credits			
Term 5		year 3	Term 6
Philosophy	5		Project Management in Information Security
Information Theory	4		IoT technology
Organization of database management systems	4		Introduction to Intelligent Cybersecurity
Digital circuit design	4		Computer Systems Architecture
Electronics	4		Industrial practice
Python programming language	4		Security of operating systems
Minor 1	5		Cryptographic methods of information security
			Minor 2
	credits 30		credits 30
total for the 3rd year = 60 credits			
Term 7		year 4	Term 8
IoT security	6		Fundamentals safety of life activity and ecology
Microcontroller Programming	6		Economics and Industrial Engineering
Mobile security technologies	4		Startups and entrepreneurship
Smart technologies	4		Fundamentals of law and anti-corruption culture
Protection of database management systems	4		Research methodology
Hardware security integration	4		Pre-graduate practice
Practical pentesting	5		Hardware security encryption technologies
Developing an application for hardware devices in Python	5		Blockchain technology
Minor 3	5		DevNet
			Managing the security of reconfigurable integrated systems
			Biometric Access Control Systems
			Diploma Work (Project) and Defence
	credits 30		credits 30
total for the 4th year = 60 credits			

totally 240 credits

For the Master's degree programmes Data Science, IITU presents the following curriculum in its Self-Assessment report:

Data Science 2023-2025 (Master's)					
Term 1		year 1	Term 2		totally 240 credits
The research work of a student, including an internship and implementation of master's thesis	2		The research work of a student, including an internship and implementation of master's thesis	3	
History and philosophy of science	4		Foreign language (professional)	4	
High School of Pedagogy	4		Psychology of management	4	
Machine Learning 1	5		Teaching practice	4	
Methods of mathematical modelling	5		Machine Learning 2	5	
Python/R for analysing data	5		Fundamentals of research work	5	
Numerical simulations using Python for DS	5		Finite-difference methods for partial differential equations	5	
Deep Learning in computer vision			Mathematical modeling of cybersecurity		
Introduction to HPC with Mpi for DS			Optimization methods for DS applications		
Databases: Advanced			Advanced Data Analysis		
Oracle database 11g: PLSQL Fundamentals (Oracle)					
credits 30			credits 30		
total for the 1st year = 60					
Term 3		year 2	Term 4		
The research work of a student, including an internship and implementation of master's thesis	5		The research work of a mas-ter's student, including an in-ternship and implementation of master's thesis	14	
The problem of retraining neural networks, data argumentation	5		Research practice	8	
Bayesian statistics and analysis	5		Registration and defense of a master's thesis	8	
Applied multivariate statistical analysis					
Mathematical modeling of enumerative combinatorics	5				
Artificial Intelligence for Social Good	5				
Machine learning methods for solving inverse problems					
Parallel computation	5				
Applied Deep Learning					
Exploratory data analysis and visualization	5				
credits 30			credits 30		
total for the 2nd year = 60					

For the PhD programmes Data Science, IITU presents the following curriculum in its Self-Assessment report:

Data Science 2023-2026 (PhD)										year 1	Term 2		year 2	Term 4		year 3	Term 6		year 4			
Term 1																						
The research work of a PhD student, including an internship and implementation of doctoral thesis		5					The research work of a student, including an internship and implementation of master's thesis (NIRD)		15								The research work of a PhD student, including an internship and implementation of doctoral thesis			25		
History and philosophy of science		4					Teaching practice		10													
Research methods		4					Research practice		5													
Deep learning in applied mathematics		4																				
Nonlinear optimization problems of machine learning																						
Game simulation and applications																						
Advanced deep learning problems		4																				
Enumerative combinatorics		4																				
Applied statistical analysis																						
Machine learning methods and algorithms																						
Conditionality of systems of linear equations		4																				
credits		29							credits		30											
total for the 1st year = 60																						
Term 3												Term 4										
The research work of a PhD student, including an internship and implementation of doctoral thesis		30							The research work of a PhD student, including an internship and implementation of doctoral thesis		25											
									Research practice		5											
credits		0									credits		30									
total for the 2nd year = 60																						
Term 5												Term 6										
The research work of a PhD student, including an internship and implementation of doctoral thesis		30									The research work of a PhD student, including an internship and implementation of doctoral thesis		18									
											Writing and defending a doctoral dissertation		12									
credits		0											credits		30							
total for the 3rd year = 60																						
totally 240 credits																						

Overall, the experts are satisfied with the curricula of all degree programmes under review. They see that the programmes are well structured and that the modules build on each other in a reasonable way, enabling the students to effectively reach the learning outcomes as laid down for each programme as a whole. Especially regarding the structure and content of the three Data Science programmes as well as the Bachelor Computer Science, the experts confirm that the respective curricula are completely fine and well suited to reach the respective objectives.

Regarding the three bachelor's degrees in the field of security, the documentation of the programmes and their structure is difficult to the experts. For example, it is not completely clear to the experts which courses are compulsory, and which are electives. One example is the course “Network Security”, which, according to the initial documents, is only an elective in the degree programme of the same name. The programme coordinators confirm in the audit that this is a mistake and that it is a compulsory course. During the audit, it happens several times that questions regarding content are clarified in such a way that they make sense in terms of the structure and design of the programmes, but do not correspond to the documents submitted. Based on discussions with the different stakeholders and a review of the coursework, exams, and final theses during the on-site visit, the experts get the impression that the programmes are well designed and structured and achieve their respective goals, but the related documentation remains unclear. Following the audit, the university submits additional documents that are intended to clarify exactly which courses are compulsory and which are electives. Unfortunately, the experts are still unable to gather this information from the additional documents with any certainty, and it is also not clearly and precisely presented on the websites. Therefore, the experts state that IITU must ensure consistency regarding the documentation specifying which courses are compulsory and which are electives (see chapter 4.3).

Even though the experts have determined that the content meets the required standards and ensures that the respective learning objectives are achieved, they believe that the academic level of all programmes could be further increased in the medium and long term. The content and objectives taught and described in the module descriptions are adequate and at an appropriate level. The examinations submitted are also in line with this, and discussions with students, alumni and industry representatives suggest that an adequate level is achieved upon graduation. However, after reviewing the final theses of the various programmes, the experts believe that their scientific level could be raised further. This applies to content-related issues as well as the scope of the respective topics – for example, many of the bachelor's theses submitted are group projects and are relatively limited in scope for a group project – but also to the layout quality in terms of the formatting of the theses and the references provided (e.g. many online links but no ‘proper’ bibliographical references).

Therefore, the experts recommend to further raise the scientific level of the programmes, and especially to ensure a higher scientific level of the final theses.

Furthermore, the experts discuss the approach of conducting all teaching in English with the university and the students. At IITU, all courses except for general education courses (e.g. Kazakh history) are taught in English. The students state that they deliberately chose IITU because it adopts this approach and they want to improve their English skills. The students state that they feel capable of studying in English in principle. The university also offers additional language courses and there is always the option of asking the lecturers to repeat individual points in Kazakh/Russian if something is not clear during the courses. The students confirm in the audit that they are satisfied with the English skills of the lecturers. The industry representatives also emphasise that they view the IITU's approach positively and have a need for graduates with the appropriate English skills. The experts also support IITU's approach and recognise that the university already offers support to both students and teachers to further improve their language skills. They acknowledge that the level of language proficiency is sufficient to conduct teaching appropriately. However, in the various discussions held on site, the experts also recognise that the language skills of teachers and students vary greatly and that there is still room for improvement on both sides in this regard. Therefore, the experts recommend to continuously develop the English language level of students and staff members.

With regard to the security-related Bachelor's degree programmes, the experts are primarily discussing with the university the approach of offering three different bachelor's programmes in the same field of security. They want to know why a programme with three specialisations is not being offered. The coordinators understand this idea and report that there used to be one programme, which was then divided into three separate programmes due to national regulations. Nevertheless, they agree with the experts that it would make more sense to offer only one programme. The first two years of study are already the same anyway. With one programme, it would also be possible to pool student numbers, which currently vary greatly between the three programmes. The average starting cohort size in the three programmes varies between 32 for hardware security and 352 for network security. During on-site discussions, the coordinators stated that they would discuss a merger again and that they themselves considered it to be sensible. However, they also pointed out that this would be a lengthy process. The experts acknowledge that the university is open to the proposed adjustment and recommend establishing only one programme in the field of security and then offer different specialization tracks or at least, merge the two programmes Computer Security and Network Security and keep and further differentiate the Bachelor's programme Hardware Security.

In addition, the experts are of the opinion that the content of the three security programmes could be updated. For example, a new course on blockchain in the security programmes is exemplarily presented as one of the latest updates of the security related curricula. However, the experts consider that blockchain is no longer a current topic or in high demand and should not be regarded as the latest development. The experts acknowledge that the content taught is fundamentally sound, but that faster updates are needed, particularly in the case of more advanced specialisation and courses covering more in-depth content (see also end of this chapter). Therefore, the experts recommend updating the content of the curricula of the three security-related Bachelor's degree programmes.

Finally, the experts want to know whether there are plans to offer a master's degree in security. They learn that this is in the planning stage, but that it requires sufficient and appropriately qualified staff, which is not easy to get, especially in this field, as the university is competing with industry for the best people. However, the IITU itself also wants to expand its range of programmes accordingly. The students also state that they would like to see a consecutive Master's programme offered in addition to the three Bachelor's programmes. The experts recognise the university's willingness to expand its range of programmes accordingly and understand that there are limitations in terms of resources. Furthermore, the experts acknowledge that there currently is a Master programme called "Computer technologies and cybersecurity". This Master's programme is covering security topics, however only with around 30% of the credit points. Therefore, this cannot be considered a consecutive Master's programme for the three Bachelor's degree programmes. For these reason, in order to further support the idea of a new consecutive programme, the experts recommend introducing a consecutive Master's degree programme in the field of security.

In summary, the experts state that these are well-established and appropriately structured programmes that ultimately achieve the planned objectives well. This is further confirmed by the high level of satisfaction among students, alumni and industry representatives.

Mobility

To enable international mobility of the students, IITU has built up a network of by now 106 partner universities, among others in Germany, Poland, Turkey, South Korea, Russia, and Malaysia, as the representatives of the Rector's office explain. According to the Self-Assessment Report and the mobility application website, students can go abroad for one

semester or an entire year, and earned credits can be recognised and transferred to Kazakh credits if the modules align with those offered by IITU.

IITU presents the following tables regarding the number of students of the various programmes participate in mobility opportunities:

For the security-related programmes:

Academic Mobility BA Security	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
South Korea	4				13	8
USA	1					
Germany	3		7	2	13	3
Poland		2				
Russian Federation			3	1	3	
Turkey				2	10	5
Czech Republic				4	4	
Malaysia			4			4
Hungary					1	1

For the Data Science programmes:

Academic Mobility of Data Science	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
South Korea	1					
Germany		1	1	1		1
Russian Federation			1		2	
Malaysia	2	1	1	1		
TOTAL	3	2	3	2	2	1

For the Bachelor's degree Computer Science:

Academic Mobility of Computer Science	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025
South Korea	1	1		1		1
Germany			1			
TOTAL	1	1	1	1	0	1

During the on-site discussion, the students state that they themselves or other students who have been abroad have generally only had good experiences with the university's support and mention that IITU's mobility centre is very supportive in this matter. They are also

of the opinion that the existing opportunities are good, but they would like to have more countries available as potential destinations. Even though the corresponding mobility statistics are not that high, the expert group recognizes that the university has focused on expanding its network of partner institutions to further encourage student participation in exchange programmes and already offers a variety of opportunities for going abroad to their students as well as their teaching staff. However, they also recognise that the range of opportunities on offer could be expanded further in order to convince even more students to take advantage of mobility opportunities in the medium term. In particular, they want to address the wishes of students who would like to see more opportunities available. Therefore, the experts recommend to further increase the opportunities regarding international mobility.

Periodic Review of the Curriculum

The curricula of all seven degree programmes under review are designed to comply with the specified outcomes and they are, according to IITU regulations, subject to constant revision processes. As such, the curricula will be reviewed regularly and commented on by students and teachers as well as by external stakeholders such as alumni or industry partners. The faculty keeps in touch with former students through the faculty alumni network. Market needs are assessed through regular surveys, as well as through contacts with employers achieved through internships and research cooperations. During the audit discussions, the programme coordinators report that the programme passports, and thus the curricula, are modified by at least 30% every three years, taking into account feedback from relevant stakeholders. However, as already mentioned, industry representatives also report that the exchange could be even better coordinated and systematized (see Chapter 1.1).

Furthermore, during the audit, the experts gain the impression that the entire process of revising the curriculum could be accelerated. Discussions with industry representatives, who mention the high level of bureaucracy, confirm the impression that many steps are necessary and that dynamic adjustments to the content are only possible in portions. For example, a new course on blockchain in the security programmes is exemplarily presented as an update of the security related curricula, although the topic is already losing relevance in the experts' opinion, while emerging areas such as AI are not yet fully integrated. The experts therefore recommend fasten the process of updating the curriculum as the innovation cycle seems to be kind of slow. For the experts, it could also be one solution to introduce more flexible course formats, such as a "selected topics" course in each programme, which can be used to discuss the latest developments of the respective field.

In summary, the experts note that clear regulations and processes for the further development of curricula are in place, which also ensure that curricula are reviewed on a regular basis. Nevertheless, in the experts' opinion, the entire process could be accelerated and cooperation with industry could also be strengthened to this end.

Criterion 1.4 Admission Requirements

Evidence:

- Self-Assessment Report
- Standard Rules for Admission to Higher and Postgraduate Educational Organizations (SRAHPEO) that Implement Higher and Postgraduate Degree Programs,
- Admission Rules for Undergraduate Programs of IITU
- Admission Rules for Master's and PhD Doctoral Programs of IITU
- Webpage IITU
- Discussions during the audit

Preliminary assessment and analysis of the experts:

IITU has published transparent regulation for the admission of students to all programme levels which outline the admission procedure and criteria as well as special provisions for the admission of foreign students. The relevant information including also deadlines, schedules, and data on tuition fees and scholarship options are also available on IITU's admission websites.

Eligible to study undergraduate programmes at IITU are people with secondary, technical and vocational, post-secondary or even higher education. Depending on the type of prior education, slightly different documentation is required for the admission process. Students can enter the programmes once a year in September. The admission is based on the so-called Unified National Test (UNT), a standardized entry examination developed and conducted by the National Testing Center of the Ministry of Science and Higher Education of the Republic of Kazakhstan. The UNT includes general as well as programme-specific examination tasks to assess whether applicants dispose of the required foundational knowledge relevant to their chosen field. The results of these tests are also the criteria for the eligibility of candidates for certain educational grants and scholarships. Moreover, IITU requires a proven level of English language of at least B1 as evidenced by recognized certificates like IELTS, TOEFLS, or the university's own language test. The university offers designated English language courses for potential applicants, an offer which is well-used by many potential

students, as described in the Self-Assessment Report. The experts appreciate this policy and the support courses as part of IITU's international approach.

The admission prerequisite for the Master's degree programme Data Science is the prior completion of a Bachelor's degree. Furthermore, applicants need to pass a Comprehensive Test conducted by the National Testing Center. The admission to this programme is open every semester.

For the doctoral programme, the Self-Assessment Report explains that strict, transparent, and binding admission requirements are in place to ensure an adequate selection of students with the ability to complete the programmes. Students can apply every semester. Applicants must hold a relevant Master's degree, have at least 9 months of work experience, provide English language proficiency and include a research proposal. In cases where minor knowledge and/ or skills gaps are noted during the entrance exam, the university may still admit the applicant but offer appropriate courses or research assignments to bridge these gaps.

As outlined by the admission regulations, applicants with proven disabilities or special needs are given additional time to complete the entry exams. Various committees ensure the independency, transparency and fairness of the admission processes. Admission decisions can be appealed in front of the university's appeal committee.

For all examinations, students can get bonus credits for socially oriented community service activities in the interests of individuals and/ or legal entities of certain kinds as outlined in the regulation on the recognition of non-academic achievements. Likewise, also subject-specific formal and informal extra-university education like online courses, academic mobility programmes or the participation in international science competitions, can be recognized if a respective committee recognizes the equivalence of the learning outcomes.

For international applicants to all programme levels, special regulations are in place which require additional documentation as well as a mandatory interview with the admission committee for programmes at all levels. The admission of international students happens exclusively on a fee-basis.

Students during the on-site discussions testify that they are informed in detail about the requirements and the necessary steps to apply for admission into the degree programmes under review.

The experts see evidence that IITU keeps track of its students' progress and achievements. In this way, an instrument is in place to monitor the performance records of students with various enrolment backgrounds. In their assessment, the experts find the admission rules to be binding, transparent, and based on IITU's written regulations. They confirm that the

admission requirements support the students in achieving the intended learning outcomes. Regarding the credit transfer for students, adequate policies are in place.

Criterion 1.5 Workload and Credits

Evidence:

- Self-Assessment Report
- Programme Passports of each degree programme
- Study plans of each degree programme
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, the IITU relies on the European Standards and Guidelines for curriculum design, workload calculation, and credit assignment, and therefore employs the ECTS credit system.

As outlined in the credit regulation, the designated workload of a full academic year “corresponds to not less than 60 academic credits and not less than 1800 academic hours. In this case, during one semester the student masters at least 30 academic credits.” All undergraduate programmes require a total of 240 ECTS credits (regular duration 8 semesters), the credit load of the Master’s degree programme is 120 ECTS credits (regular duration 4 semesters), and the allocated credit load of the 3-year doctoral programme is 180 ECTS credits (regular duration 6 semesters). The experts confirm the correspondence of these credit loads with the ESG and ASIIN criteria.

Each programme’s credit load reflects the working time and effort required from students, which includes contact hours as well as self-study time, group work, assignments, and preparation for exams. At IITU, one credit corresponds to 30 hours of total workload, covering all aspects of the student’s academic engagement, including teacher-student contact, assignments, and exams. Each semester consists of 15 teaching weeks and 2 exam weeks. Standard courses or modules typically award 5 credits, which are achieved by delivering 45 hours of teaching over 15 weeks (3 hours per week). This teaching time constitutes 30% of the total 150 hours required for earning 5 credits. The remaining 70% consists of self-study and other academic activities like laboratory work, projects, and internships. All curriculum components, including mandatory and elective modules, are assigned credits based on their workload.

Programmes at IITU have a maximum period of study which is 7 years for undergraduate degrees, 4 years for Master's degrees, and 5 years for doctoral degree. Students who do not complete all required modules and credits within this maximum period are graduated with a certificate of study at the university which lists all the completed modules, but without awarding an academic title, which the experts deem to be a reasonable policy.

In summary, the experts confirm that a workload-based credit system is implemented, which considers both contact hours and self-study time. The total credit numbers meet the ECTS users guide's minimum requirements for Bachelor's and Master's degrees. The experts can recognise from the workload information in the module descriptions that the overall workload is appropriate and corresponds to the assigned credits. This is also confirmed in the surveys conducted by IITU each semester asking the students to evaluate the amount of time they spend outside the classroom for preparing the classes and studying for the exams. During the audit, the students emphasise that they consider the workload manageable and that it is possible to finish the degree programmes within the expected periods.

Criterion 1.6 Didactic and Teaching Methodology
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Evidence:

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

Preliminary assessment and analysis of the experts:

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

The most common method of learning is class session. Lecturers generally prepare presentations to aid the teaching process. With individual or group assignments, such as discussions, presentations, case studies or written tasks, students are expected to improve their

academic as well as their soft skills. In addition, practical activities should enable students to be acquainted with practical activities for research.

In its Self-Assessment report, IITU states that “teaching staff applies didactic materials and teaching methods in line with the objectives and learning outcomes of the courses, ensuring alignment with the DP learning outcomes. According to the professional development plan, all faculty members undergo training courses, and they also participate in the annual Winter School, where they gain valuable experience, learn from each other's teaching methods, and share their own teaching practices. This exchange of expertise has a positive impact on the overall teaching process, enhancing its effectiveness. Master's and PhD students work closely with their supervisors, participate in scientific conferences, and are required to publish a scientific article before defending their thesis. The curriculum includes a course on Research Methods or Foundations of Scientific Research.”

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

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

The experts consider criterion 1 to be fulfilled.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, Concept and Organisation
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Evidence:

- Self-Assessment Report
- Module handbook for each degree programme
- Programme Passport for each degree programme
- Rules for current control of academic progress, interim and final attestation of students
- Regulation on the anti-plagiarism system
- Sample of exams and theses
- Discussions during the audit

Preliminary assessment and analysis of the experts:

In its Self-Assessment report, IITU states that “[the] most suitable forms of examination, as determined by the teaching staff, include written and oral exams, presentations, and project defenses. In addition, there are also combined forms of assessment. These methods effectively verify the achievement of LO, allowing students to demonstrate theoretical knowledge, practical skills, and independent work abilities. [...] For some courses, exams are conducted on an independent platform, Netacad, where students first need to pass tests and then create and defend virtual networks using Packet Tracer. Additionally, 4-5 courses are conducted on the Coursera platform, where students are required to complete several courses and earn certificates, which are counted as course credits. Testing is now conducted on Platonus, also test questions from Coursera are used. Furthermore, in Cyber-security, foreign professors prefer project-based assessments, where students must submit research and implementations in their respective fields.”

During the on-site visit, the experts discuss the examination forms in multiple discussion rounds and are satisfied with the variety of exams applied across the considerable number of assessments for each module. They acknowledge that small group exams are conducted for teamwork activities and positively highlight the students’ explanation that many assessments include in-class presentations which trains their public speaking skills. Internships are always assessed by two supervisors, one from the university and one from the partner company, and the assessment is based on the student’s internship diary and final report which the experts consider to be reasonable. During the on-site visit, the experts also examine exemplary tests and examinations and confirm their adequacy for the checking the attainment of the learning outcomes of the respective modules.

The corresponding grading scheme is displayed in the following table which is included in the academic policy:

Letter Grade	Numerical equivalent	Points (%)	Traditional system assessment	General description of grading criteria
A	4,0	95-100	Excellent	The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; shows a high level of knowledge that exceeds the volume provided by the syllabus, gives an exhaustive answer
A-	3,67	90-94		The student has knowledge of the subject in the full scope of the curriculum, understands the discipline deeply enough; gives an exhaustive answer
B+	3,33	85-89	Good	The student shows a complete, well-founded knowledge of the subject, but the answers did not always highlight the main idea, rational methods of calculation were not always used; the answers were mostly brief and sometimes unclear.
B	3,0	80-84		
B-	2,67	75-79		
C+	2,33	70-74		
C	2,0	65-69	Satisfactory	The student demonstrates sufficient knowledge of the subject, but without proper depth and justification, the answers are unclear and without proper logical sequence.
C-	1,67	60-64		
D+	1,33	55-59		
D	1,0	50-54		
FX	0,5	25-49	Unsatisfactory	The student demonstrates insufficient knowledge of the subject, positive answers were not given to individual questions.
F	0	0-24		The student demonstrates a very low level of knowledge of the subject.

In this grade distribution, “D” is the lowest possible passing grade; lower grades constitute a failure of the exam. In addition, there are some elective modules which are assessed only with pass or fail. These modules which can be chosen in an extent of up to 10 ECTS credits are not accounted for in the overall grade (GPA) of the students.

The university regulations allow students who missed exams for valid reasons (e.g. illness or family circumstances) to retake them. Moreover, students who get an “FX” grade need are obliged to retake the exam and have two chances to pass the exam, while students who get an “F” grade even have to re-take the entire module. In case of obtaining an unsatisfactory grade for the third time, the student is expelled from the university and loses the opportunity to enrol in this discipline again. Students who fail to meet the attendance prerequisite have to retake the entire modules at a later point in time. Moreover, students

have the opportunity to improve their exam grades on a voluntary basis by taken an additional “summer semester” at an extra fee which is organized in the break between the two regular semesters. Students have the chance to appeal against their examination results within one day from the announcement of the results in the university’s “Platonus” information system. In this case, an appeal committee is formed by lecturers of the respective subjects who are responsible for processing and reviewing the appeal. All processes regarding the examinations are also briefly and informatively outlined in the students guidebook.

The final component of all programmes at all levels are written final research projects respectively theses as outlined by the examination regulations. Students are assigned at least one supervisor according to their chosen topic. For the undergraduate programmes, this component is called final attestation, which can be done in the form of a diploma thesis or diploma project. During the on-site visits, the experts inquire about the difference between both examination forms and learn that a diploma thesis is considered to be a more theoretical research work while the diploma project consists in a practically oriented project and a respective report. In the eyes of the experts, both forms fulfil the requirement of a Bachelor’s thesis. In the Master’s degree programme, students have to end their studies with a Master’s Thesis. In the PhD programme, students finally have to hand in their dissertation. As described above, the examples of final theses presented are generally at the desired level. Nevertheless, the experts note that the academic level of the theses should be raised further (see chapter 1.3).

Formal requirements as well as the procedure for checking and ensuring the integrity of the submitted work are outlined in the anti-plagiarism system regulations. As final part, the theses need to be defended after the initial assessment of the supervisor. Detailed regulations on the procedures for thesis assessment and defence are contained in the examination regulations.

As measures of inclusivity, students with disabilities may be given extended time during exams or other accommodations, such as specialized equipment and tools for assignments, which the experts positively acknowledge.

In summary, the experts confirm that there are module-specific exams which assess the extent to which the defined learning objectives have been achieved. The types of exams are specified for each module and students are informed about the conditions for completing the individual modules. Students have sufficient time for their preparation and structural overloads are avoided. The exams are graded transparently and fairly, and students have the opportunity to review their examinations respectively consult lecturers in regarding the results. The experts acknowledge the detailed examination regulations. However, the experts point out that the level of the final theses could be increase in all programmes.

The experts further confirm that it is regularly reviewed whether the exams can adequately determine the achievement of the learning objectives and whether the requirements are appropriate to the levels of the degree programmes.

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

The experts consider criterion 2 to be fulfilled.

3. Resources

Criterion 3.1 Staff and Development

Evidence:

- Self-Assessment Report
- Staff handbook
- Internal Labor Rules and Regulations.
- University website
- Discussions during the audit

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, “academic staff of the DP Departments is categorized into 6 levels as follows (from highest to lowest): 1. Full professor, 2. Research professor, 3. Associate professor, 4. Assistant professor, 5. Senior-lecturer, 6. Assistant.” Their teaching load as well as administrative and research duties depend on the academic rank, as described in the different job descriptions for the academic ranks. During the on-site visit, the programme coordinators explain that the main workload share is designated for teaching: For junior lecturers about 80% of the workload are reserved for teaching, for full professors the share is only 50%. Research professors have an independent workload distribution as their main task is research and the supervision of students in their research projects. The exact distribution of workload hours is determined newly every semester in an individual workload plan for each academic staff member which is the basis for the monitoring the staff performance and achievements. The teaching activities of the programmes under review involve teaching staff from the two different departments: “the Department of Mathematical and Computer Modeling (MCM) and the Department of Cybersecurity. For clarity of presentation, the information from the Department of MCM is designated as programs of Cluster A.1, and the information from Cybersecurity department - Cluster A.2.” In its Self-Assessment report, IITU provides the following tables regarding the student-teacher

ratio and the involved teachers assigned to their academic position in the two Clusters A.1 and A.2.

Cluster A.1 - Student-teachers ratio

DP	Number of students	Number of teachers	Student-teacher ratio
DS (bachelor's degree)	332	23	14.43
DS (master's degree)	30	7	4.28
DS (Doctoral degree)	11	4	2.75
CS (bachelor's degree)	244	15	16.26

Cluster A.1 - Specialty teachers' breakdown by positions in the academic year 2024-2025

DP Position type	DS (bachelor's degree)	DS (master's degree)	DS (Doctoral degree)	CS (bachelor's degree)
Invited foreign professor	1			
Professor	1	2	1	
Associate Professor	4	4	3	4
Assistant Professor	4	1		5
Senior Lecturer	10			4
Assistant G1	2			2
Assistant G2	1			
Total	23	7	4	15

Cluster A.2 - Student-teachers ratio

DP	Number of students	Number of teachers	Student-teacher ratio
Computer security (bachelor's degree)	838	80	10.48
Hardware security (bachelor's degree)	75	80	0.94
Network security (bachelor's degree)	1490	80	18.63

Cluster A.2 - Specialty teachers' breakdown by positions in the academic year 2024-2025

DP	Computer security (bachelor's degree) Hard-ware security (bachelor's degree) Network se-curity (bachelor's degree)
Position type	
Invited foreign professor	
Professor	4
Associate Professor	15
Assistant Professor	10
Senior Lecturer	20
Assistant G1	13
Assistant G2	18
Total	80

First and foremost, the experts note that there are sufficient and appropriately qualified staff available to carry out the programmes. During the audit discussions, the experts want to know to what extent teachers are supported in conducting their teaching in English and improving their language skills in general. The teaching staff state that they feel capable of teaching in English and that the university also offers numerous opportunities to improve their skills. These include not only seminars, workshops, etc. on didactic or subject-specific topics, but also English language training courses. The experts note this positively. However, during on-site discussions, they note that there is a very mixed level of proficiency among teaching staff and other personnel, which further strengthens the experts' opinion that the IITU should continue to support its staff – both academic and non-academic - and students in improving their English skills (see also 1.3).

They also note that hardly any international guest lecturers are involved (see tables above). In the experts' opinion, as an explicitly 'international university', the university should invite more international lecturers in order to further develop and underline its international profile. Since teaching is already conducted entirely in English and the university has a correspondingly international structure – including in terms of administration – the experts believe that the basis for involving more international lecturers is already in place. Therefore, the experts recommend to increase the number of (international) guest lecturers. This is also supported by the students who also mention that they would like to have more contact with lecturers from abroad.

Staff development

According to the job descriptions, continuous education is one of the tasks of academic staff members at IITU. Therefore, the university offers various staff development options on a regular basis:

- Short-term training (less than 72 hours) – offsite and online trainings, seminars with invitation of foreign professors and experienced professionals.
- Medium-term training (from 72 to 100 hours) – courses and training seminars also held annually at the University, on the basis of other national and international universities and training centres.
- Long-term training (more than 100 hours) - local and international internships (master's, doctoral sabbaticals, etc.).

During the on-site visit, representatives of the teaching staff confirm that continuous education is part of their contracts and respective courses are taken on a regular basis as thus is checked as part of the key performance indicators of the staff. The main part of the mandatory staff development courses is organised digitally via Coursera, but there are also face-to-face master classes and summer schools like, e.g., an AI summer school and a project management seminar. Furthermore, the staff is supported to take part in international projects and academic staff mobility by visiting partner universities.

Moreover, active research is a core part of the academic staffs' work. The research projects also involve students and results and materials incorporated into the educational process in the form of coursework and theses, dissertations, projects, seminars, and conferences. The quantitative research output of the past 5 years is documented in the following table taken from the Self-Assessment Report:

Cluster A.1 - Department teachers' publication activity over the past 5 years

MCM dept	2020	2021	2022	2023	2024
Articles in journals with impact factor	14	17	15	21	7
Articles in journals recommended by CCSON	7	1	8	1	1
Other publications (conferences)	20	21	34	27	1
Monograph, textbook, study guide	1		1	1	
Patent, copyright certificate		2	1		

Cluster A.2 - Department teachers' publication activity over the past 5 years

Cybersecurity dept	2020	2021	2022	2023	2024
Articles in journals with impact factor	5	3	23	20	12
Articles in journals recommended by CCSON	3	1	2	10	3
Other publications (conferences)	19	3	9	24	1
Monograph, textbook, study guide			2	1	1
Patent, copyright certificate					

The teaching staff is evaluated on a regular basis through the student course surveys conducted at the end of each semester, as well as through mutual peer assessments by other faculty members, as evidenced by assessment sheets and documented results.

Furthermore, all faculty members have to draw an individual teacher plan outlining their performance goals in terms of teaching and research in the beginning of each academic year. In the end of each academic year, the staff members then compile a self-evaluation which counts into the staff performance reviews. In case of low performances or problems, corrective actions are recommended by the respective university bodies such as the Scientific and Methodological Council. As described previously, additionally there are also peer assessments among the lecturers themselves.

In summary, the experts emphasise the highly committed and motivated staff and the satisfaction of the students. They conclude that IITU has defined adequate measures for staff selection and that all programmes under review can be carried out effectively with the existing staff. In the opinion of the experts, IITU offers sufficient support mechanisms and opportunities for teaching staff members who wish to strengthen their professional and teaching skills. However, they recommend to continuously develop the English language level of the academic and non-academic staff members.

Criterion 3.2 Student Support and Student Services

Evidence:

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

Preliminary assessment and analysis of the experts:

During the on-site discussions with programme coordinators, lecturers, and particularly the students, the experts gain a thorough understanding of the available support services for students. IITU provides both subject-specific academic counselling and general non-academic guidance.

According to the Self-Assessment Report, IITU's student support system is clustered into three stages: support upon admission, support while studying, and support before and shortly after graduation.

The assistance upon admission includes the following:

- Development and provision of a student guidebook, which contains basic information about the structure and the internal regulations of the university, an explanation of basic processes like the examination regulations, and information on student services

- Conduct of an orientation week for the freshman students to get acquainted with the faculty, department, degree programmes, as well as student organizations and advisors.
- Guided compilation of the individual education plan for students to learn how to choose and register for modules.
- Video tutorial session of the university facilities

During the study period, the student support encompasses the following services:

- The mentoring programme of senior students for junior students providing both academic and non-academic tutoring and guidance. This is mainly organized by the department's student association "Organization of Students of Information Technology".
- The faculty advisor programme of staff members to support students with academic and administrative issues.
- The Health and Wellness Center as well as the Center for Psychological Assistance, which provide information on healthy living, nutrition, counselling and resources to support students' physical and mental well-being. Psychological support for students is provided by the opportunity to contact hotlines, psychological assistance and support centres, and a confidential e-mail address.
- The financial support programme which provides information on scholarships, grants, and financial opportunities for students, including advice on financial planning. The main recipients of financial support are students from low-income and large families, students with disabilities, invalids, and orphans.
- The academic support programme which helps students to improve their academic performance and study skills, through additional research training and business projects, theses, master's and doctoral dissertations, and the help to find and access to library resources.
- The extracurricular activities programme, aimed to organize student events, workshops and meetings that promote students' communication, socialization, and leadership development. This includes, among others, seminars, debates, discussions, round tables, alumni meetings and competitions.

The main service institution for graduates is the Career Center, which offers information about possible career paths, job preparation workshops, and receive advice on internship and employment. The Career Center also organizes job fairs, application trainings and industry visits.

During the on-site visit, the experts discuss the matter of student services with the students and are happy to hear that the students are overall satisfied with both academic and non-

academic student support offers as described above. Especially highlighted services are psychological advice, academic counselling, and the career day which helps to connect students and potential employers. The experts visit a start-up centre of the university which supports students in turning their ideas and research results into marketable business projects. Moreover, they also gain the impression of a well-organised campus life with multiple active student associations, among others, in the fields of sports, music, dance, and media (e.g., campus TV, student newspaper), which the experts got to know as part of the festivities for the Navruz festivities that took place during the days of the audit.

In summary, the experts confirm that IITU provides sufficient human resources and organisational structures for individual supervision and support of students, as well as administrative and technical tasks. The allocated advice and guidance on offer assist the students in achieving the learning outcomes and in completing the course within the designated time frame.

In summary, the experts positively note the good and trustful relationship between the students and the teaching staff. Enough resources are available to provide individual assistance, advice and support for all students. The support system helps the students achieve the intended learning outcomes and complete their studies successfully. The students, in general, have access to sufficient information about the programmes and are well-informed about the services available. The comprehensive support and advisory system is one of the strengths of IITU.

Criterion 3.3 Funds and equipment
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Evidence:

- Self-Assessment Report
- List of classroom equipment
- Information security regulation
- IITU website
- On-site visit of participating institutes and laboratories
- Discussions during the audit

Preliminary assessment and analysis of the experts:

As a public university, IITU mainly relies on state funding as well as the income from tuition fees. Minor income sources are research grants or contracted research for companies. Extensive financial reports checked by the respective ministry are published on the university's website.

In its Self-Assessment report, IITU presents the available resources regarding buildings and lecture rooms as follows: “In September 2024, JSC IITU acquired the building of the Baizak Business Center located [...] with a total area of 25,068.3 sq.m. Now the area of IITU is 34,897.65 sq.m. of which 33,866.15 are owned, 939.5 sq.m. are leased. The area of the two conference-halls is 868.9 sq.m., with a total of 206 seats in one and 250 in the other. The area of the sports hall is 736.6 sq.m. In Baizak building, an additional room equipped for a sports hall, with changing rooms and showers is being considered. The total area of educational premises is 4,959.02 sq.m. devoted to 24 lecture halls, 46 computer classes, 65 practical classrooms. Currently, 24 additional rooms for classes, a medical center and rooms for extra-curriculum activities in the Baizak Business Center are being prepared. To ensure the safety of students and all university staff, as well as to improve the access control system to the buildings, 58 new IP cameras were installed in the corridors, 7 turnstiles and 26 terminals with Faxe ID based on Perco and zkteco SpeedFace equipment in the entrance area of the University. Since January 2024, 348 413 353 tenge has been spent on repair work, modernization.”

“The specific premises for Cluster A programs are 7 lecture halls in main campus and Bayzak, 14 computer classes, 6 training laboratories and common areas like a library, a canteen, the medical service office, cloakrooms which are properly furnished and equipped. The classrooms and laboratories have technical passports, instructions, and safety protection journals for conducting initial instructions, and also information about the fixed assets and equipment compliant with the quality assurance certification requirements, certificate of compliance [...] The courses are studied in computer classes equipped with modern software for performing tasks related to the creation of information systems, Web applications, Web services, mobile applications, data analysis, etc. The University always ensures and monitors the timely updating of modern and necessary software such as, Kaspersky, MS Office, Visual Studio and etc. In recent years, the University's material and technical base has been significantly modernized by upgrading computer classes, laboratory equipment, educational and office furniture, the multimedia and printing equipment. Department of IT Support maintains and supports 47 computer classes and laboratories (in total 927 PCs) at the University, equipped printers, projectors, etc. The server and network infrastructure at the University consists of 20 physical servers, 5 data storage systems, 39 managed L2 and L3 switches, 62 WiFi access points. The servers have hypervisors installed to work with the virtual environment – Citrix XenServer and VMware. IP telephony service FreePBX covers 40 external lines and 120 internal numbers. The network infrastructure is updated annually, switches and access points are replaced to comply with the security system and due to the planned replacement of old equipment. Internet capacity is 1 Gbps. In 2024, additional equipment was purchased to upgrade the network infrastructure: 30

access points (UniFi U6-RL WiFi6 Enterprise), 6 switches (HPE FlexNetwork 5140 24-48G EI Switch). The server fleet was replenished with 4 new servers.”

During the on-site visit the experts visit multiple labs in the building and acknowledge that the multiple partnerships of IITU with well-known tech companies have helped the university to set up well-equipped computer laboratories which are also regularly used by the students. The experts are also of the opinion that the new building described, which they also visited during the audit, will ensure that IIT is in a good position in terms of available resources and premises in the future.

The library provides study spaces and access to both physical and digital learning and research resources. There are subscriptions to the following databases, which is confirmed by the students during the on-site interview: WebOfScience, Scopus, ScienceDirect, Wiley, and Nauka.kz. Furthermore, the library aims at broadening its access for students and staff through membership in various library associations that provide the opportunity to use a common base of resources, such as the Association of Libraries of RK HE Institutions, IFLA (International Federation of Library Associations and Institutions), and the KABIS Electronic Catalogue. The budget for the library’s print literature purchases is T 25 million (approximately EUR 45,000). During the audit, the experts visit the library and get a positive impression of the physical resources of the library.

In summary, the expert group assesses that the available funds, the technical equipment, and the infrastructure (laboratories, library, seminar rooms, etc.) are well suited to the requirements for providing the seven study programmes under review, especially after purchasing the new building.

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

The experts consider criterion 3 to be fulfilled.

4. Transparency and Documentation

Criterion 4.1 Module Descriptions
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Evidence:

- Modul Handbooks for each degree programme under review

Preliminary assessment and analysis of the experts:

During the on-site visit, the experts learn that the documentation used for the outline of the modules and its contents are the module syllabi while the module descriptions, which

were initially delivered to the experts, were specifically created for the accreditation procedure but are not used in practice. Therefore, it is not surprising that the experts find multiple deficiencies and content-wise inconsistencies in the module descriptions, and the experts base their assessment therefore on the module syllabi. As the experts note, these syllabi are extensive documents which, besides all the relevant organisational and content-related information required for the module descriptions, contain also further comprehensive information, among others about the schedule, the learning activities and assignment of each class, as well as the independent study tasks. Despite the flood of information, the experts find that the syllabi fulfil the purpose of the module descriptions and confirm that in principle, they contain all the relevant information including module name, code, the students' total workload, awarded credit points, grading scale, intended learning outcomes, content, recommended literature, possible prerequisites, name of teacher/teachers in charge, exam methods and assessment criteria. However, they also note that the syllabi submitted later is a very large and confusing document that covers the courses for all programmes to be accredited here, which are listed in no comprehensible order and also contain individual scanned documents, making it almost impossible to work effectively with this document. They therefore believe that the university should submit separate, structured and complete syllabi for each programme. In addition, the experts also note that there are no syllabi for the thesis projects for all programmes at all levels, as well as for the internships. In addition, the experts discuss the title of the module "Educational practice", which is part of the security-related Bachelor's degree programmes as well as of the Bachelor's degree programme Computer Science. They do not understand the need for an educational course in these programmes. The programme coordinators then explain that this course is more about an introduction to academic practice, where students getting to know specifics about their specialty. The experts acknowledge that this content does indeed fit into the programmes, but that this should also be clearly stated in the accompanying description. At present, it is not possible to conclude from the accompanying description what the module is about. As the completeness and correctness is crucial for the documentation of the programmes, these shortcomings are required to be addressed, and syllabi need to be issued for all modules respectively parts of the curricula and also be published in English on the university's website.

As the students and lecturers confirm, the module syllabi are available in the Platonus system for each programme. In terms of further transparency to external stakeholders and interested third parties, the experts positively acknowledge that the programme passports, which are published for all programmes on their respective websites, contain basic information about all modules of the programmes which they deem sufficient.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Exemplary Diploma Supplements
- Exemplary Transcripts of Records

Preliminary assessment and analysis of the experts:

The experts confirm that the students of the seven study programmes are awarded a Diploma/Certificate and a Diploma Supplement upon completion of their studies. As explained in the Self-Assessment Report, students can choose English, Kazakh or Russian as their preferred language for their documents. The Diploma Supplement is designed according to the template of “Europass” and contains all the relevant information categories. Instead of a separate Transcript of Records, the Diploma Supplement contains a list of all modules, credits achieved and grades of the student. While the experts are satisfied with the structure and overall information content of the documents, they notice that information on the grading scheme regarding point 4.5 (“Grading scheme and grade distribution guidance”), and the GPA is missing. These shortcomings are required to be addressed.

Criterion 4.3 Relevant Rules

Evidence:

- Self-Assessment report
- All relevant regulations as submitted and published on the university’s websites

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, the foundation of all regulations at IITU is the academic policy. The experts confirm that the rights and duties of both IITU and the students are clearly defined and binding. All rules and regulations are published on the university’s website and hence available to all stakeholders. In addition, the students receive all relevant course material at the beginning of each semester, which is confirmed by the involved parties.

As already described in chapter 1.2, the experts note that the same title is not always used for the Bachelor Hardware Security. For example, it is referred to as “Hardware means of data protection” on the website, while a different name is used in slides from a presentation given during the audit. When asked, those responsible confirm that “Hardware Security” is the correct name. The experts note that consistency must be established between the official and published names. Following the audit, the IITU updates its website, which now also uses Hardware Security as the designation. In the experts' opinion, this now ensures consistency.

In addition, the experts have a difficulty with the documentation regarding the bachelor's degree programmes under review in that some of the public documents provided are contradictory or unclear, especially regarding the information if a course is mandatory or an elective. This issue stands even after the additional document submitted after the audit. Therefore, the experts state that IITU must ensure consistency regarding the documentation specifying which courses are compulsory and which are electives (see chapter 1.3).

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

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
- Student handbooks
- Quality Manual
- Surveys' reports
- Audit-discussions

Preliminary assessment and analysis of the experts:

According to the Self-Assessment Report, IITU's quality management procedures aligned with ESG and ISO 9001-2015 standards to ensure continuous improvement of the study programmes. The quality assurance system operates on principles of professionalism, objectivity, transparency, accountability, and alignment with both national and international benchmarks. Furthermore, the focus is on the adherence to ethical standards. The quality assurance system operates on all levels of the university, including the aggregate university level, the faculty level and the department level. It includes both internal as well as external instruments of quality assurance. Various elements and examples of quality assurance measures have already been mentioned in previous parts of this report.

The Self-Assessment Report outlines the following instruments of internal quality assurance:

- Module evaluation by students: regular evaluation of the modules and learning experience at the end of each semester based on quantitative and qualitative indicators
- Programme evaluation by academic staff, students, alumni, and employers: assessment of the adequacy of learning objectives and whether the pedagogical system and the available resources of the program enable students to reach the objectives
- Program monitoring based on statistical indicators like student success rates, staff/student ratios
- Students' workload assessment: survey to ensure that the designated number of credits of each module corresponds to the respective pre-assessed workload
- Student satisfaction survey: assessment of the broader student experience at IITU, including the satisfaction with support services and extracurricular activities
- Evaluation of student support structures, including the academic advice or career advice, counselling on admission and registration, information and communication technology facilities, library and documentary resources, and teaching laboratories

The stylized results of the satisfaction surveys show the overall satisfaction with the programmes, although there is room for improvement in certain areas as described in various sections of this report. The experts positively notice that the students confirm that the results of the evaluation surveys are presented to them via the Platonus system, and that they can also get in direct contact with the relevant quality assurance office.

However, in terms of the involvement of the industrial stakeholders and potential employers of the programmes' graduates, the experts get a mixed picture of the situation. While the representatives of the Rector's office explain that an industry council was recently established to support the development of the programmes and ensure the alignment of the contents with industry needs, the industry representatives present during the audit appear to be neither involved nor informed about this council and wish for more, systematic cooperation. Nevertheless, the industrial representatives confirm to be involved in the programme development, but, as noted in previous, this process is not systematically binding and relies mostly on informal channels (see chapters 1.1 & 1.3).

Besides these internal quality assurance procedures, external quality assurance is conducted by means of different rating agencies externally assessing the university's quality in relation to other higher education institutions. The most important rankings are the rating of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken", the Independent Accreditation Agency (IAAR) and the Independent Accreditation Agencies

IAAR and IKAQAE. The results of the ratings for the programmes under review are displayed in the following table taken from the Self-Assessment Report:

No	Program	Atameken	IKQAAE	IAAR
1.	Data Science	4	1	1
2.	Computer Science	2		
3.	Computer Security	6	1	2
4.	Hardware Security	7		
5.	Network Security	9		

In addition, IITU is increasingly pursuing the accreditation of its study programmes by international accreditation agencies for the purpose of international recognition, enhancement of quality standards, and increase of reputation. The programmes under review are subject to international programme accreditation by ASIIN for the second time in form of a re-accreditation, except for the PhD-programme.

In summary, the experts confirm that the study programmes are subject to periodical internal as well as external quality assurance in a process that includes all relevant stakeholders. Students are involved in the system and the feedback loop is closed. The experts encourage IITU to continue its path of international benchmarking for enhancing the programmes' quality.

In summary, the experts are of the opinion that IITU's quality management system, guided by internal and external feedback loops, involves students, alumni and other stakeholders and ensures a comprehensive and continuous approach to programme improvement. However, they recommend to further strengthen the cooperation with industry, especially regarding the establishment of a systematic and regular exchange.

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

The experts consider criterion 5 to be fulfilled.

D Additional Criteria for Structured Doctoral Programmes

Criterion D 1 Research

Evidence:

- Self-Assessment Report
- Documented procedure for the training of Doctors of Philosophy (PhD)
- Regulations on PhD doctoral students research scientific training
- Passport of the study programme
- Module syllabi of the programme
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The main component of the doctoral programme (150 out of 180 ECTS credits) encompasses the independent research work of the doctoral students, as the corresponding regulation specifies the following structure:

- “Completion of Core and Elective Courses: PhD students must complete core courses in research methods, academic writing, and various advanced topics in data science (30 ECTS).
- Research Work and Practices: Students are required to conduct independent research, culminating in a doctoral thesis that must be defended publicly (138 ECTS).
- Thesis Defense: The final assessment involves the public defense of the doctoral dissertation, which must demonstrate original research and a significant contribution to the field (12 ECTS).”

Furthermore, IITU outlines in its Self-Assessment report, that “Doctoral candidates are encouraged and often required to participate actively in academic conferences, seminars, and research colloquiums. These activities are integral to the program and help students.” The research needs to be published as a dissertation and defended publicly to demonstrate the originality of the research and its significant contribution to the academic field. The objectives of the research work are transparently anchored in the regulations on PhD doctoral students scientific training.

The experts are satisfied with the structure of the PhD programme, and the presented examples of doctoral theses show that graduates acquire advanced, cutting-edge knowledge and can demonstrate a deep and comprehensive understanding of their research field.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 1

The experts consider Criterion D 1 to be fulfilled.

Criterion D 2 Duration and Credits

Evidence:

- Self-Assessment Report
- Passport of the study programmes
- Module descriptions
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The doctoral programme is designed for a regular duration of 3 years (6 semesters). As described in section 1.5, the regulations allow a maximum of 5 years for the completion of the programme, which the experts deem to be appropriate. As also course work is part of the curriculum, the programme follows a structured approach for which the regular credit point system of the university is used. The required number of credit points for the graduation is 180 ECTS (see also section 1.5)

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

The experts consider Criterion D 2 to be fulfilled.

Criterion D 3 Soft Skills and Mobility

Evidence:

- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The PhD programme Data Science provides the students with different offers for their personal and professional development. This includes training for professional occupation in academia like research methodology seminars, academic writing courses, as well as own teaching experience. Besides that, the research practice and various internships also provide opportunities to get insights and experience in industrial settings. Both formal and informal courses and seminars additionally address the development of the candidates' soft skills. The students receive structured mentorship for career development, research, and professional growth.

Besides these services, the doctoral students can rely on the extensive student support system of IITU as addressed in section 3.2. This includes also the opportunity to take part in international mobility activities, including student exchanges and support for the participation in international conferences.

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

The experts consider Criterion D 3 to be fulfilled.

Criterion D 4 Supervision and Assessment

Evidence:

- Self-Assessment Report
- Regulations on PhD doctoral students research scientific training
- Regulation on scientific consultants of PhD doctoral students
- Documented procedure for the training of Doctors of Philosophy (PhD)
- Dissertation council regulations

Preliminary assessment and analysis of the experts:

The experts confirm that the referenced regulations form a transparent framework for the training of PhD students, including their rights and responsibilities in relation with IITU. This includes the assignment of a “scientific consultant” as the main supervisor of the doctoral student for their dissertation. Besides the general provisions for the assessment of modules as outlined in section 1.5, the dissertation council regulations contain the provisions for the assessment of the dissertation which is concluded with a public oral thesis defence. The dissertation council consists of at least six members, at least 50% of which must be representatives from other universities or institutions than IITU. The experts confirm that the assessment rules are reasonable, clearly defined, and binding.

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

The experts consider Criterion D 4 to be fulfilled.

Criterion D 5 Infrastructure

Evidence:

- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the experts:

IITU's doctoral candidates operate with the infrastructure that is used for the delivery of all programmes at the university, as described in section 3.3. The experts confirm that the available infrastructure and resources provide an adequate environment for the PhD research work.

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

The experts consider Criterion D 5 to be fulfilled.

Criterion D 6 Funding

Evidence:

- Self-Assessment Report
- Discussions during the audit

Preliminary assessment and analysis of the experts:

Based on the Self-Assessment Report and the explanations of the representatives of the Rector's office, the experts confirm that IITU as a reliable financial basis for the delivery of the programmes.

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

The experts consider Criterion D 6 to be fulfilled.

Criterion D 7 Quality Assurance
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Evidence:

- Self-Assessment Report
- Websites of the study programme
- Dissertation council regulations
- Stylized results of the programme satisfaction survey
- Discussions during the audit

Preliminary assessment and analysis of the experts:

The university provides an extensive regulatory framework for the structured Doctoral degree programmes Data Science under review (compare section D 4). This ensures that good scientific practice is followed, which the experts confirm based on the dissertation council regulations and the presented examples of PhD theses. The programme is integrated into the regular monitoring and quality assurance mechanisms of the university as described in section 5, and are accordingly evaluated and developed.

Final assessment of the experts after the comment of the Higher Education Institution regarding criterion D 7:

The experts consider Criterion D 7 to be fulfilled.

E Additional Documents

After the on-site visit, IITU hands in the following updated/additional documents:

- Syllabi for all programmes,
- Curricula overviews regarding the three security-related Bachelor's degree programmes
- Catalog of minors for students admitted in 2023 for the three security-related Bachelor's degree programmes
- Updated enrolment statistics

F Summary: Expert recommendations

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Computer Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Computer Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Hardware Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Network Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ma Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
PhD Data Science	With requirements	30.09.2031	-/-	-/-

Requirements

For all Programmes

- A 1. (ASIIN 4.1) Provide complete and reviewed module descriptions / syllabi.
- A 2. (ASIIN 4.2) Review the Diploma Supplement and provide information on the grading scheme regarding point 4.5, the GPA, and statistical data that allow for an assessment of the relative student performance.

For all Bachelor's Degree Programmes

- A 3. (ASIIN 4.3) Ensure consistency regarding the documentation specifying which courses are compulsory and which are electives.

Recommendations

- E 1. (ASIIN 1.3 & 3.1) It is recommended to continuously develop the English language level of students and staff members.

- E 2. (ASIIN 1.1 & 1.3 & 5) It is recommended to strengthen the cooperation with industry, especially regarding the establishment of a systematic and regular exchange.
- E 3. (1.3) It is recommended to further raise the scientific level of the programmes, and especially to ensure a higher scientific level of the final theses.
- E 4. (ASIIN 1.3) It is recommended to fasten the process of updating the curriculum.
- E 5. (ASIIN 1.3) It is recommended to update the content of the curricula.
- E 6. (ASIIN 1.3) It is recommended to further increase the opportunities regarding international mobility.
- E 7. (ASIIN 3.1) It is recommended to increase the number of (international) guest lecturers.

For all three Ba “Security Programmes”

- E 8. (ASIIN 1.3) It is recommended to reflect and consolidate the number of Bachelor programmes in the field of security.
- E 9. (ASIIN 1.3) It is recommended to introduce a consecutive Master’s degree programme in the field of security.

G Comment of the Technical Committee 04- Informatics/Computer Science (11.09.2025)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discusses the procedure and follows the experts' assessment without any changes.

Assessment and analysis for the award of the Euro-Inf® Label:

The Technical Committee deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Computer Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Computer Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Hardware Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Network Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ma Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
PhD Data Science	With requirements	30.09.2031	-/-	-/-

H Decision of the Accreditation Commission (26.09.2025)

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

The AC discusses the procedure and suggests an editorial change to recommendation E 4. Otherwise, the AC follows the assessment of the experts and the technical committee without any changes.

Assessment and analysis for the award of the Euro-Inf® Label:

The Accreditation Commission deems that the intended learning outcomes of the degree programmes do comply with the Subject-Specific Criteria of the Technical Committee 04 – Informatics/Computer Science.

The Accreditation Commission decides to award the following seals:

Degree Programme	ASIIN Seal	Maximum duration of accreditation	Subject-specific label	Maximum duration of accreditation
Ba Computer Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Computer Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Hardware Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Network Security	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ba Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
Ma Data Science	With requirements	30.09.2031	Euro-Inf	30.09.2031
PhD Data Science	With requirements	30.09.2031	-/-	-/-

Requirements For all Programmes

A 1. (ASIIN 4.1) Provide complete and reviewed module descriptions / syllabi.

- A 2. (ASIIN 4.2) Review the Diploma Supplement and provide information on the grading scheme regarding point 4.5, the GPA, and statistical data that allow for an assessment of the relative student performance.

For all Bachelor's Degree Programmes

- A 3. (ASIIN 4.3) Ensure consistency regarding the documentation specifying which courses are compulsory and which are electives.

Recommendations

- E 1. (ASIIN 1.3 & 3.1) It is recommended to continuously develop the English language level of students and staff members.
- E 2. (ASIIN 1.1 & 1.3 & 5) It is recommended to strengthen the cooperation with industry, especially regarding the establishment of a systematic and regular exchange.
- E 3. (1.3) It is recommended to further raise the scientific level of the programmes, and especially to ensure a higher scientific level of the final theses.
- E 4. (ASIIN 1.3) It is recommended to speed up the process of updating the curriculum.
- E 5. (ASIIN 1.3) It is recommended to update the content of the curricula.
- E 6. (ASIIN 1.3) It is recommended to further increase the opportunities regarding international mobility.
- E 7. (ASIIN 3.1) It is recommended to increase the number of (international) guest lecturers.

For all three Ba "Security Programmes"

- E 8. (ASIIN 1.3) It is recommended to reflect and consolidate the number of Bachelor programmes in the field of security.
- E 9. (ASIIN 1.3) It is recommended to introduce a consecutive Master's degree programme in the field of security.

Appendix: Programme Learning Outcomes and Curricula

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Science:

- “LO1: Explain the choice of basic standards, principles, and design patterns, methods, tools, and programming languages, including methods and tools for building information security systems. ICT
- LO2: Apply mathematical models and methods of various processes
- LO3: Design database, software, and information system architect
- LO4: Design and develop ergonomic user interfaces
- LO5: Analyze the market for software and hardware, information products and services for creating and modifying information systems
- LO6: Demonstrate sociability, initiative and psychological readiness for work, including when working in a team, and make managerial and technical decisions
- LO7: Use methods for studying large data sets
- LO8: Installation of information system software and database loading
- LO8: Apply research methodologies in data science
- LO9: Participation in the management of technical support of an information system during its operation
- LO10: Conduct a comprehensive analysis and analytical synthesis of research results using modern science and technology, skills of independent data collection, study, analysis and generalization.
- LO11: Able to apply the acquired knowledge according to the selected additional educational program.
- LO12: Demonstrate the ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability

of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture. “

The following **curriculum** is presented:

Computer Science 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Information and Communication Technologies	5		Political science	2
Discrete mathematics	6		Sociology	2
Algebra and Geometry	4		Physical Culture	4
Introduction to Programming	6		Physics	4
WEB technology	5		Mathematical analysis	6
			Educational practice	7
		Programming in Python	4	
credits 31			credits 29	
total for the 1st year = 60				
Term 3		year 2	Term 4	
Kazakh (Russian) language	5		Kazakh (Russian) language	5
Psychology	7		Algorithms and data structures	6
Cultural studies	2		Database theory	5
History of Kazakhstan	5		Professional Internship	4
Physical Culture	4		Computational mathematics	5
Object-oriented programming	7		Mathematical statistics for programmers	5
Design and administration in MS EXCEL	5			
credits 30			credits 30	
total for the 2nd year = 60				
Term 5		year 3	Term 6	
Fundamentals safety of life activity and ecology			Philosophy	5
Fundamentals of law and anti-corruption culture			PL/SQL programming	5
Startups and entrepreneurship	5		Data analysis and visualization in Power BI	5
Economic theory			Numerical methods of analysis and algebra	5
Research methodology			Application development in ASP.NET	5
Professionally oriented foreign language	4		Minor 2	5
Business correspondence in the state language	2		Professional Internship	4
Programming on Internet of Things (IOT)	5			
Minor 1	5			
Development of Web applications in Java Spring	5			
credits 26			credits 34	
total for the 3rd year = 60				
Term 7		year 4	Term 8	
Operation research	6		Pregraduation practice	5
Advanced WEB technology	5		Algorithmic aspects of machine learning	6
Advanced database theory	6		Human-computer interaction	
Algorithm Design and Analysis	4		Parallel programming	5
Minor 3	5		Amazon Web Services Foundations (AWS Foundations)	
Exploratory data analysis	5		Development of mobile applications on IOS	5
			Development of mobile applications on Android	
credits 31			Diploma Work (Project) and Defense	8
credits 31			credits 29	
total for the 4th year = 60				

totally 240 credits

totally 240 credits

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

- “LO1: Give reasons for the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and means for building information security systems of modern ICTs.
- LO2: Apply mathematical models and methods of various processes
- LO3: Create mathematical models using methods of modern information technologies.
- LO4: Demonstrate communication skills, initiative and psychological preparedness for work, including when working in a team and making managerial and technical decisions.
- LO5: Extract relevant information from a variety of sources, including real-time information flows.
- LO6: Analyze the information received.
- LO7: Have excellent programming skills.
- LO8: Be able to develop new algorithms.
- LO9: Process large amounts of information.
- LO10: Conduct multivariate analysis.
- LO11: Recognize logical connections in a system of collected information.
- LO12: Be able to use advanced analytical tools.
- LO13: Able to apply acquired knowledge in the chosen additional educational program.
- LO14: Demonstrate the ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology and life safety. Ability to apply entrepreneurial skills to problems calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.”

The following **curriculum** is presented:

Data Science 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Information and Communication Technologies	5		Physical Culture	4
Algebra and Geometry	4		Mathematical analysis 1	6
Introduction to Programming	6		Physics	4
WEB technology	6		Educational practice	2
Discrete Mathematics and Mathematical Logic	6		Programming in Python	4
			Probability Theory	3
credits	32		credits	28
total for the 1st year = 60				
Term 3		year 2	Term 4	
Kazakh (Russian) language	5		Kazakh (Russian) language	5
History of Kazakhstan	5		Political science	2
Physical Culture	4		Sociology	2
Object-oriented programming	7		Mathematical analysis 2	5
Differential Equations	5		Algorithms and data structures	6
			Computational mathematics	5
			Professional Internship	4
			Statistics for data analysis	5
credits	26		credits	34
total for the 2nd year = 60				
Term 5		year 3	Term 6	
Psychology	2		Philosophy	5
Cultural studies	2		English for STEM	2
Research methodology			Machine Learning 1	5
Fundamentals safety of life activity and ecology			Advanced Mathematics for Machine Learning	5
Fundamentals of law and anti-corruption culture	5		Minor 2	5
Startups and entrepreneurship			Professional Internship	4
Economic theory			Numerical analysis	6
Professionally oriented foreign language	4			
Python for Data Analysis	5			
Database theory	5			
Minor 1	5			
credits	28		credits	32
total for the 3rd year = 60				
Term 7		year 4	Term 8	
Business correspondence in the state language	2		Pregraduation practice	5
Operation research	5		Data analysis and visualization in Power BI	3
Methods of nonlinear programming	5		Methods for solving inverse ill-posed problems	6
Deep learning for Applied Mathematics	5		Deep learning of inverse problems	6
Machine learning 2	5		Neural Networks	6
Exploratory data analysis	5		Diploma Work (Project) and Defense	8
Optimal management	5			
Minor 3	5			
credits	32		credits	28
total for the 4th year = 60				

totally 240 credits

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Computer Security:

- “LO1. Applies the principles of organization, management and protection of databases. Applies data protection skills in corporate infrastructure and corporate cybersecurity. Knows how to use identity and application access management techniques.
- LO2. Able to use a variety of mathematical and natural science methods of physics to solve specific engineering problems. Owns a mathematical apparatus for the design of hardware components and electrical networks.
- LO3. Able to apply digital forensics methods and has practical pentesting skills. Applies reverse engineering techniques to investigate malicious code. Demonstrates knowledge of modern information recovery technologies in the event of failures and attacks.
- LO4. Knows how to use the principles of construction, types and functions of operating systems and applies the available methods of protection and security of operating systems. Able to analyze operating systems and various applications for potential vulnerabilities and threats. It can implement various mechanisms for protecting applications and scripts from modifications using programming and design methods.
- LO5. Demonstrate the ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.
- LO6. Demonstrates the ability for written and oral communication in the state language and the language of interethnic communication, use foreign sources of information, possesses communication skills, owns the technique of office work in the state language, has the skills of public speaking, argumentation, discussion and polemics in a professional foreign language.
- LO7. Applies information security technologies, including various encryption, decryption and cryptanalysis operations, which are based on mathematical research and information theory in the field of information security, as well as apply existing legislation in the field of information security.
- LO8. Knows how to set up computer networks, knows the features of routing and switching wired and wireless computer networks. Knows the features of the architecture of computer systems and networks. Uses DevNet tools related to network programming and scripting for network applications.

- LO9. Knows how to program various applications using algorithmization methods, object-oriented programming, web technologies, knows how to optimize program code using specialized corporate applications on the Django framework, develop, maintain and test secure applications and programs, including mobile technologies and their security. Knows the organization of blockchain technologies and is able to develop smart contracts.
- LO10. Demonstrates an understanding of history and philosophy as a methodology of human activity, readiness for self-knowledge, is able to apply the methods of psychology, cultural studies and find organizational and managerial solutions in non-standard conditions and with the help of political science and sociology, systematize knowledge about world and Kazakhstani legislation in the field of information security.
- LO11. Uses methods of cloud technologies and intelligent cybersecurity with machine learning. It also uses methods to counter cyber intelligence and is able to minimize the cyber risks of various applications.
- LO12. To be able to apply the acquired knowledge in the chosen additional educational program.”

The following **curriculum** is presented:

Table 10.1. Curriculum of the degree programme

Computer Security 2023-2027					
Term 1		year 1	Term 2		year 2
Foreign language	5		Foreign language	5	
Kazakh (Russian) language	5		Kazakh (Russian) language	5	
History of Kazakhstan	5		Psychology	2	
			Information and Communication Technologies	5	
Mathematical analysis	6		Cultural studies	2	
Legal Basics of Information Security	4		Physical Culture	4	
			Algebra and Geometry	4	
			Algorithmization and Programming	6	
			Educational practice	2	
credits 25			credits 35		
total for the 1st year = 60 credits					
Term 3		year 2	Term 4		year 3
Political science	2		Professionally oriented foreign language	2	
Sociology	2		Web technologies	4	
Physical culture	4		Basics of the Linux operating system	4	
			Switching, Routing, and Wireless Essentials	6	
Physics	4		Basic Circuit Theory	4	
Mathematical foundations of information security	6				
Object-oriented programming (Java)	6		Business correspondence in the state language	2	
Computer Networking Basics	6		Industrial practice	4	
			Computer Information Protection Technologies	4	
credits 30			credits 30		
total for the 2nd year = 60 credits					
Term 5		year 3	Term 6		year 4
Philosophy	5		Project Management in Information Security	4	
Information Theory	4		Information recovery technologies		
Organization and architecture of computing systems	4		Introduction to Intelligent Cybersecurity	4	
Organization of database management systems	4		Security of operating systems	4	
Python programming language	4		Cryptographic methods of information security	4	
Introduction to Cybersecurity Incident Investigation	5		Corporate Cyber Security	4	
Minor 1	5		Industrial practice	4	
			Minor 2	5	
credits 31				credits 29	
total for the 3rd year = 60 credits					
Term 7		year 4	Term 8		year 4
Digital Forensics	5		Economics and Industrial Engineering		
Practical pentesting	6		Startups and entrepreneurship		
Protection of database management systems	5		Fundamentals of law and anti-corruption culture	5	
Introduction to Cloud	4		Fundamentals safety of life activity and ecology		
Mobile security technologies			Research methodology	2	
Identity and access management			Pre-graduate practice	5	
Development of corporate applications on the Django framework	6		Protection of applications and scripts from modifications		
Minor 3	5		DevNet	5	
			Blockchain technology		
		Cyber risk and cyber intelligence			
		Reverse Engineering	4		
		Diploma Work (Project) and Defence	8		
credits 31			credits 29		
total for the 4th year = 60 credits					

totally 240 credits

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Hardware Security:

- “LO1. Applies IoT technologies, electronics and digital circuitry and the principles of hardware components to build SMART technologies and biometric access control systems.
- LO2. Able to use the principles of construction, types and functions of operating systems and applies the available methods of protection and security of operating systems. It is able to analyze operating systems and various applications for potential vulnerabilities and threats.
- LO3. Applies the principles of organization, management and protection of databases. Applies data protection skills using intelligent cybersecurity techniques.
- LO4. Able to program various applications using algorithmization methods, object-oriented programming, web technologies, is able to optimize program code using specialized corporate applications on the Django framework, develop, maintain and test secure applications and programs including mobile technologies and their security. Knows the organization of blockchain technologies and is able to develop smart contracts.
- LO5. Applies information security technologies, including various encryption, decryption and cryptanalysis operations, which are based on mathematical research and information theory in the field of information security, as well as apply existing legislation in the field of information security.
- LO6: Demonstrates an understanding of history and philosophy as a methodology of human activity, readiness for self-knowledge, is able to apply methods of psychology, cultural studies and find organizational and managerial solutions in non-standard conditions and with the help of political science and sociology, systematize knowledge about world and Kazakh legislation in the field of information security.
- LO7: Demonstrate the ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with the anti-corruption culture.
- LO8. Able to use a variety of mathematical and natural science methods of physics to solve specific engineering problems. Owns a mathematical apparatus for designing hardware components and electrical networks and digital circuitry.
- LO9: Demonstrates the ability to written and oral communication in the state language and the language of interethnic communication, use foreign sources of

information, has communication skills, knows the technique of office work in the state language, has the skills of public speaking, argumentation, discussion and polemics in a professional foreign language.

- LO10. Knows how to set up computer networks, knows the routing and switching features of wired and wireless computer networks. Knows the features of the architecture of computer systems.
- LO11. Able to program microcontrollers, integrate hardware and hardware security systems using the principles and methods of IoT security.
- LO12. Has practical pentesting skills. DevNet uses tools related to network programming and scripting for network applications.
- LO13. Applies hardware security encryption technologies and manages the security of reconstructed embedded systems.
- LO14. To be able to apply the acquired knowledge in the chosen additional educational program”

The following **curriculum** is presented:

Hardware Security 2023-2027					
Term 1		year 1	Term 2		
Foreign language	5		Foreign language	5	
Kazakh (Russian) language	5		Kazakh (Russian) language	5	
History of Kazakhstan	5		Psychology	2	
			Information and Communication Technologies	5	
Mathematical analysis	6		Cultural studies	2	
Legal Basics of Information Security	4		Physical Culture	4	
			Algebra and Geometry	4	
			Algorithmization and Programming	6	
			Educational practice	2	
credits	25		credits	35	
total for the 1st year = 60 credits					
Term 3		year 2	Term 4		
			Professionally oriented foreign language	2	
Political science	2		Web technologies	4	
Sociology	2		Basics of the Linux operating system	4	
Physical culture	4				
Physics	4		Switching, Routing, and Wireless Essentials	6	
Mathematical foundations of information security	6		Basic Circuit Theory	4	
Object-oriented programming (Java)	6		Business correspondence in the state language	2	
Computer Networking Basics	6		Industrial practice	4	
			Computer Information Protection Technologies	4	
credits	30		credits	30	
total for the 2nd year = 60 credits					
Term 5		year 3	Term 6		
Philosophy	5		Project Management in Information Security	4	
Information Theory	4		IoT technology	4	
Organization of database management systems	4		Introduction to Intelligent Cybersecurity		
Digital circuit design	4		Computer Systems Architecture	4	
Electronics	4		Industrial practice	4	
Python programming language	4		Security of operating systems	4	
Minor 1	5		Cryptographic methods of information security	5	
			Minor 2	5	
credits	30		credits	30	
total for the 3rd year = 60 credits					
Term 7		year 4	Term 8		
IoT security	6		Fundamentals safety of life activity and ecology	5	
Microcontroller Programming	6		Economics and Industrial Engineering		
Mobile security technologies	4		Startups and entrepreneurship		
Smart technologies			Fundamentals of law and anti-corruption culture		
Protection of database management systems	4		Research methodology	5	
Hardware security integration			Pre-graduate practice	2	
Practical pentesting	5		Hardware security encryption technologies		
Developing an application for hardware devices in Python			Blockchain technology		
Minor 3	5		DevNet	5	
			Managing the security of reconfigurable integrated systems		
			Biometric Access Control Systems	5	
			Diploma Work (Project) and Defence	8	
credits	30		credits	30	
total for the 4th year = 60 credits					
totally 240 credits					

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Bachelor degree programme Network Security:

- “LO1. Apply knowledge and understanding of facts, phenomena, theories and complex dependencies in the field of legislation of the Republic of Kazakhstan and countries of the world, as well as digital investigation, standardization and certification procedures in the field of information security, master the methods of forensics and information protection.
- LO2. Apply knowledge about the architecture of computer systems, manage operating systems, system parameters and security of operating systems as well as host security and network monitoring analysis.
- LO3. Apply knowledge of the hardware element base and their physical properties.
- LO4. Apply data protection technologies in computer systems and networks, as well as own blockchain technologies and cloud services for secure data storage.
- LO5. Apply knowledge in the field of cryptography and various methods of information security using theoretical mathematical solutions
- LO6. Develop an enterprise information security policy, apply project management tools, apply mathematical modeling methods, perform a qualitative and quantitative assessment of project risks, determine the economic efficiency of a project.
- LO7. Apply software development skills to work with various applications, be able to develop mobile applications and work with databases.
- LO8. Collect and interpret information to form judgments, taking into account social, ethical and scientific considerations, possess the skills of speaking in foreign languages and be able to work with projects in the field of information security.
- LO 9. Know the methods of scientific research and academic writing and apply them in the field of study.
- LO10. Apply theoretical and practical knowledge to solve practical and professional tasks in the field of implementing network connections between devices, calculate and apply addressing schemes, set up and configure network devices.
- LO11. Develop secure server client web applications and mobile applications.
- LO12. Collect and process information from various sources, including in a foreign language. Be able to apply the knowledge gained to study and develop projects, as well as analyze and implement the developed projects in practice.
- LO13. Own a mathematical apparatus for solving engineering problems and know the basic physical properties of objects.
- LO14. To be able to apply the acquired knowledge in the chosen additional educational program.”

The following **curriculum** is presented:

Network Security 2023-2027				
Term 1		year 1	Term 2	
Foreign language	5		Foreign language	5
Kazakh (Russian) language	5		Kazakh (Russian) language	5
History of Kazakhstan	5		Psychology	2
Mathematical analysis	6		Information and Communication Technologies	5
Legal Basics of Information Security	4		Cultural studies	2
			Physical Culture	4
			Algebra and Geometry	4
			Algorithmization and Programming	6
			Educational practice	2
credits 25			credits 35	
total for the 1st year = 60 credits				
Term 3		year 2	Term 4	
Political science	2		Professionally oriented foreign language	2
Sociology	2		Web technologies	4
Physical culture	4		Basics of the Linux operating system	4
Physics	4		Switching, Routing, and Wireless Essentials	6
Mathematical foundations of information security	6		Basic Circuit Theory	4
Object-oriented programming (Java)	6		Business correspondence in the state language	2
Computer Networking Basics	4		Industrial practice	4
			Computer Information Protection Technologies	4
credits 30				credits 30
total for the 2nd year = 60 credits				
Term 5		year 3	Term 6	
Philosophy	5		Project Management in Information Security	4
Information Theory	4		Network infrastructure security	
Organization of database management systems	4		Introduction to Intelligent Cybersecurity	4
Digital circuit design	4		Industrial practice	4
Python programming language	4		Security of operating systems	4
Enterprise Networks, Security, and Automation	5		Cryptographic methods of information security	4
Minor 1	5		Network Security	4
			Minor 2	5
credits 31				credits 29
total for the 3rd year = 60 credits				
Term 7		year 4	Term 8	
Practical pentesting	6		Fundamentals safety of life activity and ecology	
WLAN Enterprise Technologies	6		Economics and Industrial Engineering	
Mobile security technologies			Startups and entrepreneurship	
Digital forensics of network infrastructure	4		Fundamentals of law and anti-corruption culture	5
Minor 3	5		Research methodology	2
Protection of database management systems	4		Pre-graduate practice	5
Introduction to Cloud			DevNet	
Development of corporate applications on the Django framework	6		Managing network infrastructure vulnerabilities	5
Intrusion detection and prevention systems			Blockchain technology	
			Network Interconnection	
			Analytics of Information Security Center	4
			Diploma Work (Project) and Defence	8
credits 31			credits 29	
total for the 4th year = 60 credits				
totally 240 credits				

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the Master's degree programme Data Science:

- "LO1: Argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and tools for building information security systems of modern ICT.
- LO2: Apply mathematical models and methods of various processes
- LO3: Create mathematical models using the methods of modern information technologies.
- LO4: Build a mathematical model of energy problems
- LO5: Develop and / or use software, hardware, information, mathematical, and functional support for information systems, including algorithms and methods of information security
- LO6: Demonstrate communication skills, initiative and psychological preparedness for work, including when working in a team and to make managerial and technical decisions
- LO7: Build 3D visualizations
- LO8: Extract the desired information from various sources, including information flows in real time
- LO9: Apply research methodology in the field of data science
- LO10: Solve applied problems of data processing and analysis in order to identify hidden dependencies in them
- LO11: Carry out a comprehensive analysis and analytically summarize the results of scientific research using modern achievements of science and technology, skills of independent data collection, study, analysis and generalization."

The following **curriculum** is presented:

Data Science 2023-2025 (Master's)					
Term 1		year 1	Term 2		totally 240 credits
The research work of a student, including an internship and implementation of master's thesis	2		The research work of a student, including an internship and implementation of master's thesis	3	
History and philosophy of science	4		Foreign language (professional)	4	
High School of Pedagogy	4		Psychology of management	4	
Machine Learning 1	5		Teaching practice	4	
Methods of mathematical modelling	5		Machine Learning 2	5	
Python/R for analysing data	5		Fundamentals of research work	5	
Numerical simulations using Python for DS	5		Finite-difference methods for partial differential equations	5	
Deep Learning in computer vision			Mathematical modeling of cybersecurity		
Introduction to HPC with Mpi for DS			Optimization methods for DS applications		
Databases: Advanced			Advanced Data Analysis		
Oracle database 11g: PLSQL Fundamentals (Oracle)					
credits	30		credits	30	
total for the 1st year = 60					
Term 3		year 2	Term 4		
The research work of a student, including an internship and implementation of master's thesis	5		The research work of a mas-ter"s student, including an in-ternship and implementation of master"s thesis	14	
The problem of retraining neural networks, data argumentation	5		Research practice	8	
Bayesian statistics and analysis	5		Registration and defense of a master's thesis	8	
Applied multivariate statistical analysis					
Mathematical modeling of enumerative combinatorics	5				
Artificial Intelligence for Social Good					
Machine learning methods for solving inverse problems	5				
Parallel computation					
Applied Deep Learning	5				
Exploratory data analysis and visualization					
credits	30		credits	30	
total for the 2nd year = 60					

According to the programme's passport the following **objectives** and **learning outcomes (intended qualifications profile)** shall be achieved by the PhD programme Data Science:

- “LO1: Apply research methodology in data science.
- LO2: Solve applied data processing and analysis problems in order to identify implicit dependencies.
- LO3: Conduct a comprehensive analysis and analytically summarize the results of research using modern scientific and technological tools, obtain the skills of independent data collection, study, analysis and generalization.
- LO4: Conduct a statistical analysis: build a confidence interval, hypothesis testing, regression and analysis of variance.
- LO5: Able to analyze data using the Python programming language.
- LO6: Substantiate the results obtained during the study.
- LO7: Able to construct a mathematical model of a practical problem and to develop a computer model (software product)”

The following **curriculum** is presented:

Data Science 2023-2026 (PhD)				
Term 1		year 1	Term 2	
The research work of a PhD student, including an internship and implementation of doctoral thesis	5		The research work of a student, including an internship and implementation of master's thesis (NIRD)	15
History and philosophy of science	4		Teaching practice	10
Research methods	4		Research practice	5
Deep learning in applied mathematics	4			
Nonlinear optimization problems of machine learning				
Game simulation and applications	4			
Advanced deep learning problems				
Enumerative combinatorics	4			
Applied statistical analysis				
Machine learning methods and algorithms	4			
Conditionality of systems of linear equations				
credits	29		credits	30
total for the 1st year = 60				
Term 3		year 2	Term 4	
The research work of a PhD student, including an internship and implementation of doctoral thesis	30		The research work of a PhD student, including an internship and implementation of doctoral thesis	25
			Research practice	5
credits	0		credits	30
total for the 2nd year = 60				
Term 5		year 3	Term 6	
The research work of a PhD student, including an internship and implementation of doctoral thesis	30		The research work of a PhD student, including an internship and implementation of doctoral thesis	18
			Writing and defending a doctoral dissertation	12
credits	0		credits	30
total for the 3rd year = 60				

totally 240 credits