ASIIN Seal

Accreditation Report

Bachelor's Degree Programme
Computational Sciences and Statistics

PhD Degree Programme
Computational Sciences and Statistics
Pure and Applied Mathematics
Robotic Systems

Provided by
Al Farabi Kazakh National University

Version: 27th of June 2023

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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]
Вычислительные науки и статистика	Computational Sciences and Statistics	ASIIN		04, 12
Вычислительные науки и статистика	Computational Sciences and Statistics	ASIIN		04, 12
Фундаментальная и прикладная математика	Pure and Applied Mathematics	ASIIN		12
Робототехнические системы	Robotic Systems	ASIIN		04
Date of the contract: 12.01.2023 **Submission of the final version of the self-assessment report:** 27.01.2023 **Date of the onsite visit:** 03. – 04.05.2023 **at:** Al-Farabi Kazakh National University, Faculty of Mechanics and Mathematics,				
Expert panel: Prof. Dr. Madina Abdykarim, Suleyman Demirel University Prof. Dr.-Ing. Dietrich Paulus, University of Koblenz Prof. Dr.math. Rüdiger Reischuk, University of Lübeck Prof. Dr. Thomas Götz, University of Koblenz Dr. Marc Vandemeulebroecke, Novartis Pharma AG Darya Akhmetova, student at the International Information Technology University				
Representative of the ASIIN headquarter: Dr. Andrea Kern				

[1] ASIIN Seal for degree programmes

[2] TC: Technical Committee for the following subject areas: TC 04 - Informatics/Computer Science; TC 12 - Mathematics

Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of May 15, 2015 ASIIN General Criteria, as of December 10, 2015 Subject-Specific Criteria of Technical Committee 04 – Informatics/Computer Science as of March 29, 2018 Subject-Specific Criteria of Technical Committee 12 – Mathematics as of December 9, 2016 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
Computational Sciences and Statistics	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS	annually/2021
Computational Sciences and Statistics	Ph.D.	-	8	Full time	-	6 Semester	180 ECTS	annually in spring/ 2020
Pure and Applied Mathematics	Ph.D.	-	8	Full time	-	6 Semester	180 ECTS	annually in spring/ 2020
Robotic Systems	Ph.D.	-	8	Full time	-	6 Semester	180 ECTS	annually in spring/ 2020

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

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

Since the beginning of the university, a large focus of the university lay on science and research, represented by the main aim of the university “science and innovation”. Bilateral

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

agreements exist between KazNU and 550 universities in 50 countries; therefore the number of international students in total is around 3,000. The university additionally operates branches in Turkey and Kyrgyzstan, and plans to open to intergovernmental institutes in Uzbekistan and Russia.

The four study programmes under review are taught at the department of Mechanics and Mathematics. The faculty of Mathematics is one of the oldest at KazNU, which continuously developed new study programmes to accommodate new achievements in science and demands on the job market.

For the Bachelor's degree programme "Computational Sciences and Statistics", the institution has presented the following profile in the self-assessment report:

"The EP [educational programme] is focused on the formation of students' current knowledge and competencies in the field of computational sciences and statistics, the creation of mathematical and computer models of real processes based on computational and statistical data, the choice of modern methods of their research, the creation of applications and software products to solve the problems of professional activity in the studied fields of sciences, the formation of skills for scientific research and educational activities at the university and research institute."

For the Doctoral degree programme "Computational Sciences and Statistics" the institution has presented the following profile in the self-assessment report:

„The program is aimed at training highly qualified scientific, pedagogical and scientific personnel, competitive in the domestic and international labour market in accordance with their needs and the prospects for the development of the country and the region. The EP is focused on the formation of students' deep knowledge in the field of computational science, calculation methods, analysis of the convergence of schemes, the use of statistical methods for data analysis and forecasting based on mathematical calculations, the development of skills in the implementation of scientific research and pedagogical activities at the university and research institutes."

For the Doctoral degree programme "Pure and Applied Mathematics" the institution has presented the following profile in the self-assessment report:

"The purpose of the Mathematics PhD program is to provide the next generation of Mathematicians with an excellent and innovative mathematical education; to provide training of PhD students able to implement fundamental scientific studies and developments in the Mathematics the high scientific level, meeting the international requirements, introducing the substantial contribution to the development of new scientific ideas, approaches, meth-

ods and methodologies in corresponding fields of mathematical science, requiring the exposition of deep responsibility considerable independence and creative initiative in complex and unpredictable professional situations."

For the Doctoral degree programme "Robotic Systems" the institution has presented the following profile in the self-assessment report:

"Preparation of highly qualified scientific and scientific-pedagogical personnel capable of innovative activity in the field of robotics, education, on the basis of an in-depth study of the theoretical and methodological foundations for the creation and study of robotic systems, as well as the systematic use of knowledge and methodology of related scientific fields and digital technologies; able to create new conceptual knowledge that develops science, to reasonably present it to specialists and to draw up the results of scientific research in the form of scientific publications in foreign peer-reviewed scientific journals and publications, to test the results of research activities at national and international conferences; able to participate in the implementation of the educational process and form educational materials for the educational process as part of the educational program."

C Expert Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Self-assessment report
- Webpage of the Ba programme „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/bachelor/speciality/2209
- Webpage of the PhD programme „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/2044
- Webpage of the PhD programme “Pure and Applied Mathematics” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1846
- Webpage of the PhD programme “Robotic systems” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1937
- Learning Objectives-Module Matrix of each study programme
- Diploma and diploma supplement
- Discussion during the audit

Preliminary assessment and analysis of the peers:

The university describes in its self-assessment report that the bachelor programme builds a bridge between computer sciences and mathematics, providing education in the growing field of advanced computational power and statistical methods. Students learn how to create mathematics and computer modules based on computer and statistical data in order to solve complex problems. Computational and statistical approaches are applied in many related disciplines today to understand natural and social-economic systems. In this programme, KazNU combined the fields of mathematics statistics with computational sciences as one interdisciplinary programme addressing mathematical modelling, numerical analysis, the development of algorithms, software implementation, programme execution as well as the visualisation of results.

The university has presented the following aims and programme learning outcomes (PLOs) in the SAR and on their webpage:

PLO1	Demonstrate mathematical literacy, logical thinking and knowledge of the basic concepts and ideas of mathematics methods, master the mathematical language in the subject area.
PLO2	Choose modern methods of computational science and statistics and apply them in solving problems of natural science.
PLO3	Be able to formulate and test statistical hypotheses that correspond to the data of the studied problem.
PLO3	Master the methods of computational mathematics and statistics as the main tools for solving complex mathematical models and problems at the present time.
PLO5	Analyze the results of computational work and visualize the processes described by mathematical models based on them.
PLO6	Use programming tools and develop new programs for implementing methods of computational mathematics and statistics.
PLO7	Summarize the results of research and computational work in the relevant fields of science in the form of participation in research projects and presentations at conferences.
PLO8	Create computer models of real processes based on computational and statistical data.
PLO9	Create mathematical models of the object under study based on the principles and tools of mathematical methods.
PLO10	Use methods for quantifying statistical data of different nature.
PLO11	Create applications to software packages for optimizing professional activity in the studied fields of science, conduct laboratory and numerical experiments, and evaluate the accuracy and reliability of simulation results.
PLO12	Work in a team, argue for the correct choice of solutions to mathematical and statistical problems; critically evaluate their activities, the activities of the team, and be able to self-education and self-development.

On this basis, the students should learn, among others, competences in the probability theory and statistics, differential equations and computational mathematics, basics in programming, numerical methods, quantum computing as well as stochastic processes and machine learning. Graduates of this programme can enter the job market in the following professions: education, research, design and engineering, operation, programming, data analysis, and financial business.

In the doctoral programme “Computational Sciences and Statistics”, students receive an in-depth education in the respective field of science. The students learn how to do research in the field of computational science, calculation methods, analysis of the convergence of schemes, the use of statistical methods for data analysis, and forecasting based on mathematical calculations. KazNU defines the following PLOs for this programme

PLO1	Conduct scientific research and obtain new fundamental and applied results, critically analyse and evaluate the results obtained, formulate well-grounded conclusions even in conditions of incomplete or limited information.
PLO2	Write scientific articles in foreign and domestic scientific journals and inform the wide scientific community of advanced topics and research results at international and national conferences, seminars and workshops, critically assessing their significance.
PLO3	Write independently scientific projects and applications, setting a theoretical or practical computational problem or a solution method that is relevant for society, implement and correct, if necessary, the process of independent scientific research.
PLO4	Determine the direction and intensity of their professional development in the chosen scientific field, be able to work in a team and contribute to the development of the team and society as a whole.
PLO5	Conduct scientific research in the field of methodology of computational experiments based on the approximation of differential equations by the methods of finite differences, volumes and / or elements.
PLO6	Conduct a fundamental analysis of computational methods and difference schemes for convergence and correctness, including in the case of high-performance algorithms.

PLO7	Create and use correct structured, curvilinear, unstructured computational grids in computational tasks.
PLO8	Develop parallel computing algorithms for engineering problems and implement them in high-performance systems, develop quantum computing algorithms.
PLO9	Use methods of mathematical statistics based on real data for the selection of parameters, adaptation and testing of computing systems based on real experiments.
PLO10	Use deep learning, reinforcement learning, data mining techniques to adapt the computational algorithm to effectively predict outcomes.

The main task of the doctoral students is to conduct research and apply scientific research tools. In addition, the advanced mathematic logic, high performance computing, approximation methods, adaptive computational girds, and new computation methods are further integrated in the modules of this programme. Graduates of this study programme can enter the job market in the following fields

- Teaching mathematics and programming in secondary, secondary special and higher schools, training centres;
- Research activities in the field of computational sciences;
- Engineering and analytical activities in research and production and production institutions;
- Data analysis in financial spheres;
- Performance of works on design, adjustment, operation and maintenance of computer systems.

In the doctoral programme “Pure and Applied Mathematics”, the main content focuses on fundamental and innovative mathematical methods and the development of these methods on a high scientific level. The students start to develop ideas for a substantial contribution to new scientific ideas, approaches, methods in corresponding fields of mathematical

science. Today, mathematics is integrated into various disciplines of fields in science, technology and engineering as well as medicine and business. The university presents the following PLOs on their webpage and in the self-assessment report:

PLO1	To use innovative pedagogical technologies, methods for teaching mathematical disciplines; develop assessment tools, guidelines, methodological manuals.
PLO2	On the basis of deep system knowledge in the field of model theory, algebra, differential equations, mathematical physics, create forecasting techniques, modelling complex systems.
PLO3	Formulate tasks and hypotheses that create interest in the global scientific community.
PLO4	Conduct research work, solve problems, prove theorems, creating competition to the advanced scientific community.
PLO5	Lead (or be in the forefront) of a scientific school in the direction of Algebra. Actively working with leading foreign scientists in this direction.
PLO6	Lead (or be in the forefront) scientific school in the direction of mathematical logic. Actively working with leading foreign scientists in this direction.
PLO7	Lead (or be in the forefront) scientific school in the direction of Differential Equations. Actively working with leading foreign scientists in this direction.
PLO8	Lead (or be in the forefront) scientific school in the direction of Mathematical Physics. Actively working with leading foreign scientists in this direction.
PLO9	Organize and manage scientific conferences. Management of scientific seminars.
PLO10	To conduct expert opinions on scientific works in the following directions: theory of models, algebra, differential equations, mathematical physics. And also to do a review on the work of undergraduates, doctoral candidates, theses and scientific articles.
PLO11	Advise commercial organizations on mathematical modeling of processes and forecasting their behavior.

PLO12	To own and use linguistic and linguistic knowledge for communication and publications in multilingual and multicultural society in the international arena.

Graduates from the programme have received training to work in teaching disciplines of mechanical and mathematical cycles and computer science in higher education or work on teaching physics, mathematics or computer science in secondary schools. In addition, graduates can enter research in the field of mathematics and technical sciences or conduct engineering activities in the research or production. Alternative job opportunities exist in the field of financial mathematics or in the field of modelling and computational mathematics.

The doctoral programme “Robotic systems” trains students to be capable of innovation and research in the field of robotics and education in the field of robotics. The programme lies a theoretical and methodological foundation for the creation, application, programming and development of robotic systems as well as their systematic use of knowledge and methodology. The university presents the following PLOs on their webpage and in their self-assessment report:

PLO1	Scientifically justified to analyse and evaluate modern scientific achievements in the field of robotics to generate new ideas in solving research and practical problems, formulating and solving atypical problems of a design character in the design, manufacture and operation of new robotic systems and scientific guidance on research on the scientific problems of fundamental robotics and applied character.
PLO2	Apply modern research, modelling and design methods to create new classes of mechatronic and robotic systems, including intelligent robotic systems and mobile robots.
PLO3	To develop methods for research and modelling of mechatronic and robotic systems for various purposes, including those with elements of artificial intelligence and technical vision; to develop and research promising algorithms and methods for controlling mechatronic and robotic systems.
PLO4	Conduct a research examination of completed research and experimental de-

	velopment to summarize the results of research, plan and conduct experimental research, followed by an adequate assessment of the results; apply the results of research activities in the creation and research of promising robotic and mechatronic systems, new models of manipulation, mobile, humanoid and parallel robots; introduction of research and development into production.
PLO5	Professionally present the results of their research and present them in the form of scientific publications, information and analytical materials and presentations for the objective assessment of the professional level of scientific research results, including using international databases of publication activity; to present the results in the professional community and publish research results in academic journals.
PLO6	Use modern methods and technologies of scientific communication in the state and foreign languages for professional interaction with colleagues and foreign partners in order to improve the practice of education and science, participate in the work of domestic and international research teams and in scientific discussions in the academic and professional environment by the decision of scientific and scientific educational tasks, conducting joint research in the field of robotics and attracting additional funding.
PLO7	Participate in the implementation of the educational process of the educational organization using innovative educational technologies and teaching methods to form the professional competencies of students and researchers, determine the course content and form educational and methodological support for the educational process as part of the Robotic systems educational program.
PLO8	Follow ethical standards in professional work, own a culture of scientific research, including using the latest information and communication technologies, plan and solve problems of their own professional and personal development, introduce students to the system of social values and tolerant interaction in society to form professionally significant qualities of students.

The main competences of the graduates are on research and research methods. The graduates additionally have skills in artificial intelligence in mechatronics and robotics, intelligent robotic systems, technical visions, parallel and humanoid robot design, and mechatronics and dynamics of mobile robots and CAD. Graduates from this programme usually

find job opportunities in teaching profession, teaching robotics in secondary, secondary special and higher schools or at training centres. Job qualifications are also fulfilled in the field of research in the field of robotics and in engineering activities in research and production. Further potential occupations work on design, adjustment, operation and maintenance of robots and robotic systems.

The expert panel discusses with the representatives of the rector's office how the development of the programmes is conducted. The representatives explain that at state universities in Kazakhstan, study programmes are in close observation by governmental agencies, which inspect the programmes on a regular basis. The university cooperates further with local businesses on education and science to receive advise on the how to improve individual study programmes and how to attract more students to higher education. The university further issues its own strategic plan with main topics, which shall be integrated into all study projects. The current strategic plan includes internationalization and sustainability. Therefore, the university aims to improve the international mobility of students and staff.

As all study programmes under review were established between 2019-2020, the experts are interested in the motivation to establish these programmes at KazNU. The representatives of the rectors' office explain to the experts, that the university has gained the status of a research university in 2022 and has therefore initiated new master and doctoral programmes to emphasise this status. These new programmes have a strong focus on computer science and technology, which currently are topics favoured also by the government. Nevertheless, the representatives of the rector's office add that the development of each programme is strongly controlled by the government. The programme coordinators add to this discussion that there existed no similar programmes in Kazakhstan to the bachelor and PhD study programmes "Computational Sciences and Statistics." These programmes were created with the motivation to educate the students in modern topics such as machine learning and artificial intelligence. A comparable modern approach lead to the PhD programme "Robotic systems" where bachelor and master programmes with the same title are offered at KazNU. Concerning the PhD programme "Pure and Applied Mathematics", the programme coordinator explain that a PhD in mathematics exists at KazNU; however, they wanted to put a stronger focus on applied mathematics, particularly on mathematical modelling. In their opinion, more experts in mathematical modelling are needed to study the subjects of agriculture, climate change, ecology, and water resources in Kazakhstan. The expert panel can follow these explanations; yet they are consider this focus is not really recognizable in the PhD-programme. In addition, they question the motivation to combine pure and applied mathematics in one study programme and the justification to run this separately, in addition to an existing PhD, which is quite similar. The programme coordinators state they wanted to distinguish this programme from other programmes offered by

other universities in Almaty. Although their motivation based on including a higher degree of applied mathematics in the programme, they still wanted to offer the possibility to the students to choose their field of expertise themselves. The programme coordinators add that the teaching staff of the PhD programme "Pure and Applied Mathematics" consists of researchers from the Institute of Mathematics and Mathematical Modelling of the National Academy of Sciences of the Republic of Kazakhstan. Their staff comprises experts of the various fields of mathematics; thus if students want to write their PhD thesis on a specific topic, this researcher from the Institute can offer specific courses on this topic. Therefore, the flexibility of the students' field of interest is guaranteed. The experts acknowledge this collaboration.

The industrial partners of the university confirm their satisfaction of the qualifications of the graduates. They state to the experts that graduates of the PhD programmes have reached the level to conduct their own research and develop their own scientific ideas. They add that graduates from these PhD programmes reach strong competences in theoretical knowledge, but could slightly improve their practical skills. Further, they describe the soft skills of graduates of all degree programmes as very good. This leads to the fact that out of 100 students who conduct an internship at their companies, around 25 are jobs offered after graduation.

In conclusion, the initially presented relevance of the objectives and learning outcomes of the programmes are well reflective of the Kazakh labour market and society needs. The curricula are regularly reviewed in a process that involves the relevant stakeholders (in particular from higher education and professional practice) and, if necessary, the objectives are revised accordingly. The experts state that the objectives and learning outcomes reflect the targeted academic qualification level, are feasible and equivalent to the relevant exemplary learning outcomes specified in the applicable SSC.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-assessment report
- KazNU webpage https://www.kaznu.kz/en
- Ministry of Education and Science Republic of Kazakhstan, Unified System of Management of Higher Education (ESUVO)

- Webpage of the Ba programme „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/bachelor/speciality/2209
- Webpage of the PhD programme „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/2044
- Webpage of the PhD programme “Pure and Applied Mathematics” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1846
- Webpage of the PhD programme “Robotic systems” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1937
- Diploma and diploma supplement presented during the audit
- Discussion during the audit

Preliminary assessment and analysis of the peers:
The university describes the name for the bachelor and doctoral programme in “Computational Sciences and Statistics” was chosen to represent the interdisciplinary character of this study programme. The curriculum of both programmes contains modules on mathematical statistics and computational science and covers additionally overlapping study fields in their application in science and technology. Similar combinations between applied mathematics and computer sciences exist at various universities around the world offering comparable interdisciplinary study programmes.

The doctoral study programme “Pure and Applied Mathematics” combines different disciplines in mathematics. The programme covers the fundamental fields of mathematics in science and the applied fields in technology, engineering, medicine, business, commerce and finance. The study programme offers the students the choice to develop their competences and research skills in the field of their interested. The combination of pure and applied mathematics in one programme is also available at other universities around the globe, supporting the combinations of the two different disciplines of mathematics in one programme.

The doctoral programme “Robotic systems” was developed to address one new key area in the field of science, engineering and technology. The name derives from the various disciplines of robotics addressed in the programme and the inspiration from other international study programmes.

During the discussion on the content of the study programmes in reference to the name of the content of the curricula, several issues arise with different discussion partners. The experts state that the extent of statistics in the curricula presented for the bachelor and doctoral programme “Computational Sciences and Statistics” is not sufficient to justify the name of the study programme. Since the discussion with the programme coordinators and

the industrial partners revealed a strong desire to foster statistics in Kazakhstan, the experts acknowledge their point of view. Nevertheless, the content of the study programmes has to match the name of the study programme, which is currently not substantiated. A misunderstanding is further evident in the name of the PhD study programme "Robotic system." Although the presented curriculum suggests a focus on robotic systems, the discussion with all partners, the statements of the students, and the visitation of the laboratories indicate a focus on robotics instead. The experts therefore can currently not fully comprehend the origins of the titles of the study programmes and insist in this case that the content and title of the study programme need to match. Thus, the expert panel insists that the curriculum and the learning outcomes need to be in alignment with the title of the study programmes for the bachelor study programme "Computational Sciences and Statistics" as well as the doctoral study programmes "Computational Sciences and Statistics" and "Robotic systems". The expert panel suggests to either adapting the content of the curricula to justify the name of the study programme or change the title of each educational programme.

In addition, the experts noticed an inconsistent use of English translations for all programmes. In particular, a confusion exists about the names "Computational Sciences and Statistics" and "Computational Sciences and Statistics." While the self-assessment report and the webpage of the university mainly use the name "Computational Sciences and Statistics" several documents list the alternative name including "information on the employment of graduates" or "Scientific cooperation with organizations/universities." During the on-site visit, other names occurred on documents such as "Computing Science(s) and Statistics". Although the submitted documents for the doctoral programme "Pure and Applied Mathematics" are consistent in their use of a programme title, during the on-site visit several labels and descriptions used the name "Fundamental and applied mathematics", which should be avoided in the future.

Criterion 1.3 Curriculum

Evidence:

- Self-assessment report
- Module handbooks of all study programmes
- Curricular overview of each study programme
- Learning objectives-module matrix

- Data on student mobility presented by the university
- Discussion during the audit

Preliminary assessment and analysis of the peers:
The bachelor programme “Computational Sciences and Statistics” has a study duration of eight semesters or four academic years. In each year, on average, the student has a workload of 30 ECTS credit points, resulting into 240 credits in total. All three PhD programmes under review comprise 180 ECTS credit points, which shall be completed in three academic years or six semesters. All study programmes at KazNU are offered in Kazakh, Russian and English. In the PhD programmes, Russian and English language tend to be the most dominating languages.

All curricula undergo continuous monitoring. At the end of each academic year, a periodic review of the curriculum is discussed within the Academic Committee of the faculty to ensure the learning outcomes of the programme can be reached. This includes various levels of reviews from the outcome of the learning programmes down to the assessment of the syllabus of modules.

The bachelor programme “Computational Sciences and Statistics” was developed to allow graduates to combine knowledge and skills of computational mathematic and statistics. The programme combines theoretical and practical training, which are complimented by modules in general education. The curriculum considers mandatory and elective modules.

The curriculum is divided into basic education, basic disciplines, major disciplines, professional training and the final thesis (bachelor thesis). The following overview is presented in the self-assessment report.

GENERAL EDUCATION DISCIPLINES		CORE DISCIPLINES		MAJOR DISCIPLINES	
OBLIGATORY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
51	5	94	18	36	24
56		**112**		**60**	

TERM				
1	Social and Cultural Development Module & Instrumental Module & Module Physical Training 25 ECTS		Mathematical Foundations 9 ECTS	34
2	Instrumental Module & Physical Education Module 12 ECTS	Elective component (1 of 6) 5 ECTS	Mathematical Foundations 6 ECTS	23
3	Instrumental Module & Physical Education Module 7 ECTS	Probability Theory and Statistics & Differential Equations and Computational Mathematics & Basics of Programming 24 ECTS		31
4	Social and Cultural Development Module & Physical Education Module 7 ECTS	Probability Theory and Statistics & Differential Equations and Computational Mathematics & Basics of Programming 24 ECTS		29
5	Numerical Methods	Additional Chapters of Computational Mathematics 6 ECTS	Mathematical Logic and Statistics	30

	6 ECTS			18 ECTS	
6	Numerical Methods 6 ECTS	Additional Chapters of Computational Mathematics (1or2) 12 ECTS		Mathematical Logic and Statistics 12 ECTS	30
7	Quantum Computing 6 ECTS	Queuing Systems 6 ECTS		Specialized Computing & Statistics and its Applications (1 or 2) 24 ECTS	36
8	Professional (Training) Practice 9 ECTS		Professional (pre-diploma) practice 3 ECTS	**FINAL ATTESTATION** 12 ECTS	24

The mandatory courses allow the students to achieve competence of mathematical literacy, logical thinking and knowledge of the basic concepts and ideas of mathematics methods. Elective modules on numerical methods, quantum computing, stochastic processes and machine learning allow the graduate to create computer simulations for real processes based on computational and statistical data.

In the discussion, the expert panel first raises a question on the integration of research in the bachelor and PhD programmes. Already bachelor students have to participate in research, which could not clearly be distinguished from the research level in the doctoral programmes according to the submitted self-assessment report. The university explains that research projects are presented in the classroom from the beginning of their studies to inspire the student to conduct their own research. On a voluntary basis, bachelor students can participate in research projects, which can lead to bachelor thesis projects and potential continuation in the student's research in their master studies. In Kazakhstan, 10% of all research grant money should support students (training, salary, etc.) to increase their integration in research. In contrast, the programme coordinators explain that PhD students are actively and deeply involved in scientific activities and projects. The topic of each PhD project should be linked with the research already taking place at KazNU. The students comment that they usually choose their supervisor based on their discipline of interest in the first semester of their studies, which gives them enough time to conduct their own research in the opinion of the experts. Despite their clear explanation, the experts consider that the level of research in the bachelor and doctoral programmes is not adequately pre-

sented in the module handbook. The expert panel therefore recommends to clearly defining the scientific level of each study programme as well as the extent of the research required for the final thesis.

Furthermore, the expert panel inquires on the teaching language, which is listed as Kazakh, Russian and English for all modules in the module handbook. The representatives of the rector's office confirm that all courses on the bachelor and master level are organized in various languages. In the PhD programmes, the language of instruction is mainly Russian and English. The students consent with this statement; they add that they can choose the language of instruction before the semester starts. If at least two students choose one language, the courses will be offered in this language. Further, students can change their language of instruction once during their studied after submitting an application. The experts consider this exceptional but worry about the teaching load of organizing the same modules in multiple language at the same time. The representatives of the rector's office add that all courses are all coordinated by the faculty, who give information to the students and ensures that the content is equal in all languages. Next to the main language of instructions, the experts consider English should be included in all study programmes. The students and the teaching staff mention that few courses are fully organized in English for everyone. This includes one module in the bachelor programme and two courses in each PhD programme. The teaching staff adds that there are lecturers in all subjects who are capable of conducting the lecture in English. The expert panel notes that the inclusion of multiple languages is an excellent strategy; nevertheless they could not find any documentation for the students on how to choose or change their language of instructions. Although the module handbook lists these options, the mechanism of choosing a language track is not sufficiently explained in the submitted documents. The experts further shared their opinion that it is not necessary to have all courses in English in the bachelor programme.

The experts further note that in the self-assessment report, multiple representations of the curriculum of the bachelor programme "Computational Sciences and Statistics" were presented; however, none of the available structures would result in the 240 ECTS credit points as initially stated in the overview charts and the webpage. Furthermore, the discussion with the programme representatives indicates that changes in the curriculum will be implemented in a few weeks. The experts clarify that any edits of the curriculum must be communicated with the accreditation agency. The university has submitted the new curriculum for review after the on-site visit. Nevertheless, the presented overview does not allow comprehending a clear structure of the bachelor programme, particularly the workload on each semester. The experts note that a more detailed overview of the curriculum does show a workload of 30 ECTS credit points each semester and a total amount of 240 ECTS credits

points of the entire programme; however, the presentation is inconsistent with other overviews submitted by KazNU. Therefore, the experts still lack a comprehensive presentation of the study programme, which shows the modules and the actual workload of the students in each semester. The correct order of the modules also needs to allow the students to learn all prerequisites for each module. Furthermore, the workload for the students' needs to be clearly stated using ECTS credit points, which needs to be consistent in all presentations of the study programmes in documents and other platforms. Overall, the experts raised multiple issues with the curriculum of the bachelor programme concerning missing topics of great importance to the students' qualifications at graduation. The experts miss topics such as multi-dimensional calculus, optimisation, and mathematical modelling, foundations of programming languages, basic algorithms, basic Boolean methods, and automata. Furthermore, the experts raise their concerns due to the large amount of small modules (equal three or less ECTS credit points) in the curriculum. In the expert's opinion, the large amount of modules causes a fragmentation of the content and raises the number of exams for the students. In addition, the content listed in the module handbook for these modules often exceeds the time available in these lectures. The experts therefore recommend reducing the number of modules and regrouping them into modules with more ECTS credit points. In this revision, the experts further suggest reviewing the content of the modules and adjusting the included topics in accordance with the total workload of the modules.

The expert panel addresses also the question on internships with the industrial partner from the university. They confirm that they regularly receive interns from KazNU. Within their companies, they usually have a specific department who handles applications and conducts interviews with the students.

Based on the self-assessment report and the submitted module handbook of the bachelor programme, the experts are not certain if the final thesis is mandatory for every student. The programme coordinators confirm that every student has to write a final thesis/bachelor thesis. The thesis can only be postponed in case of emergency, sickness or pregnancy. An application is necessary to extent the duration of the bachelor studies since most students receive governmental grants, and thus follow strict regulations. The programme coordinators specify that students start to work on their bachelor thesis during their last two semesters, which gives them enough time to conduct their research and write the thesis. In the middle of their work on their thesis (between April and May), students have to present their preliminary work in a mid-control exam. In this way, the progress, scope, level and direction of the bachelor project can be checked and discussed. The programme coordinators declare that the level of scientific work in the bachelor thesis is significantly different to the level of research in the PhD thesis. The experts point out that the presentation

does not match the module description in the module handbook, which lists the final attestation as “elective.” Since the ASIIN criteria require a mandatory final thesis, the experts point out that the situation needs to be clarified and the module descriptions needs to be adapted to reflect the actual situation in the bachelor study programme “Computational Sciences and Statistics.”

The aim of the PhD programmes is to ensure a continuous level of practice and training. The university outlines in their self-assessment report that the study programmes are designed to give the graduates various possibilities on the job market, ranging from scientists to teachers to engineers.

General diagram encompassing all disciplines in the educational program «Computational Sciences and Statistics» 8D05405

1 semester	Credits	2 semester	Credits	3 semester	Credits	4 semester	Credits	5 semester	Credits	6 semester	Credits	Total credits
M-1 Academic writing(in English)	2	Teaching Internship	10	Research Practice	5	Research Practice	5	Scientific Internship	10	PhD Thesis Writing and Defence	12	
The implementation of a Doctoral Thesis	3	The implementation of a Doctoral Thesis	11	The implementation of a Doctoral Thesis	14	The implementation of a Doctoral Thesis	15	The implementation of a Doctoral Thesis	8	The implementation of a Doctoral Thesis	2	
Research Seminar	3	Research Seminar	2	Research Seminar	8	Research Seminar	4	Research Seminar	3	Research Seminar	1	
		Graduate Seminar	6			Graduate Seminar	6	Graduate Seminar	6			
M-1 Scientific Research Methods	3			Participation in International Scientific Conferences	3			Participation in International Scientific Conferences	3	Publication of the Main Scientific Results of the Dissertation in Scientific Results of the Dissertation in Scientific Journals	15	
M-2 Curvilinear adaptive meshes	5											
M-2 Advanced Statistics	5											
M-1 Quantum Computing \\ Big Data & High Performance Statistical Computing	5											
M-2 Finite element method \\ Intelligent systems for monitoring and forecasting processes	5											
Total credits	31	Total credits	29	Total credits	30	Total credits	30	Total credits	30	Total credits	30	180

COLOR INTERPRETATION (in table)

RESEARCH			CORE DISCIPLINES		MAJOR DISCIPLINES	
UNIVERSITY COMPONENT	SEMINAR	DOCTORAL THESIS	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
31	39	53	15	5	20	5
123			20		25	

FINAL ATTESTATION
12 ECTS

Within each PhD programme, there are compulsory and elective courses divided into “research”, “core disciplines” and “major disciplines”. In the first semester, the students have to complete the mandatory modules on “Academic writing” and “Scientific research methods” which are not part of any of these groups. In all three groups, mandatory modules are part of the curriculum complementing the theoretical and practical knowledge from the master and bachelor programmes. A catalogue of available electives modules is presented to the students in the online “Univer” system. The PhD thesis and its defence is an additional module awarding twelve credit points and takes place in the sixth semester.

Each PhD programme contains a module “Teaching Internships“, which builds upon pedagogical skills learned in the bachelor and master programme. This teaching internship has a workload of ten ECTS credit points. During the period of teaching practice, doctoral students are involved in conducting classes in undergraduate and graduate programmes but also improve the theoretical knowledge in pedagogical practice. According to the plan of the PhD programmes at KazNU, the “Teaching internships” are carried out at the second semester of the first year. The module description for the teaching internship is missing in the presented module handbook during the on-site visit.

Within each PhD programme, the largest module is “Research work” awarding in total 123 ECTS credit points and stretching across all semesters. This module combines the scientific work that the students have to carry out for their PhD thesis as well as the additional work they need to spend on publishing their scientific data, attending conferences. Part of this module is also a research internship called “Research Practice” with ten ECTS credit points. This module allows the students to participate in research outside the campus to get practically involved in the latest theoretical, methodological and technological developments in their field of sciences. In many cases, the PhD students will spend time in laboratories outside KazNU to collect new experience and data for the doctoral thesis. This internship usually takes place in the third or fourth semester (the second academic year).

The expert panel discusses the curriculum of all PhD programmes with the programme coordinators. In general, the experts inquire how the elective subjects are organized within the PhD programmes due to their low number of students. The programme coordinators explain that the electives allow the students to deepen their knowledge on subjects of their interest. Therefore, the electives are also organized even if only one student wants to take the modules. In practice, the students in programmes with low numbers of students often agree on courses as a group in order to find electives of their joint interest they can take together. This situation is also confirmed by the teaching staff.

The topic of internships is further raised by the expert panel in the context of the PhD programmes. Next to the industrial partners, agreements for internships also exist between their institutions at the National Academy of Sciences of the Republic of Kazakhstan and the university, which serve also as a basis for the student internship programmes. Interns are usually involved in research projects to gain experience and deepen their capabilities in research. In addition, the industrial partner are aware of teaching internships, which the students commonly conduct at different universities.

The next questions addresses the balance between computational mathematics and statistics in the study programme “Computational Sciences and Statistics.” The experts remark that the modules presented in the module handbook currently only reflect courses on the

topic computational sciences and few modules in statistics. The programme coordinators explain that so far all students choose the track on computational sciences. They add that all students start with the same courses in their PhD studies and then choose their electives in the progress of their studies. The experts insists that all courses and specialisation within the programme have to be presented if they are chosen by students or not. This includes the lectures on statistics, in order for the students to be aware of their choices in their studies. Therefore, all potentially offered modules need to be included in the module handbook even if no student decided to take them. In addition, the description of modules in the PhD programme does not represent the level of a PhD programme. Examples for this are high performance computing, quantum computing, and finite elements. The programme coordinators consider the problem might be a general description, which does not represent the depth of the lectures in the PhD programme.

Within the PhD programme “Pure and Applied Mathematics”, the experts also criticize the presentation of the modules in the module handbook. In many cases, the reading list does not appear to be up-to-date with the modern literature whereas the module descriptions require more details to match the level of a PhD programme. Similar to the PhD programme “Computational Sciences and Statistics” the programme coordinators defend that the origin of the problem is the module description and not the content of the module in the classroom.

The experts also raise several questions on the required prerequisites of the students who enrol in the PhD programme “Robotic systems.” The expert panel inquires several skills and competences of the students they do not recognize in the presented curriculum. This includes control theory, real time systems, ROS (robotics operating system), 3-dimensional vision, control loop, image processing, and safety and security. The programme coordinators explain that several qualifications are learned in the bachelor or master programmes “Robotic systems” such as control theory, computer vision, 2-dimensional vision and various design courses. Further discussions did not fully clarify the situation, however the presented curriculum of the bachelor and master programmes confirm the presence of the topics under consideration in their curricula. However, in the opinion of the experts, especially the amount and content of ROS should be improved. Moreover, the visit of the different laboratories presented the expert panel with much details on the skills of the PhD students and showed that the students have much of the desired skills. Nevertheless, the experts wonder, why the curriculum is mainly based on “Robotic systems” while the laboratory work by the students was mainly on robotics. This is connected to a discussion on the programme name as described in more detail in criterion 1.2.

The experts are further unclear on the publication requirements for the PhD students in order to graduate. In the module handbook, the description mentions that seven publications are mandatory. During the different discussion rounds on the on-site visits, the expert panels receives different explanations and numbers of required publications before a document is handed to the experts clearly stating four different methods to publish. This document explains the publication requirements in more details and shows four different schemes for publications depending on the level of the journals. For example, if students publish one scientific article in a journal listed as Q1, it is sufficient to graduate; if they publish their work on a scientific journal listed as Q2, two publications are required for graduation.

Due to the various issues with the module handbooks of all four study programmes under review, the expert panel considers it necessary to review and revise all module handbooks in order to verify the level of the programmes and of the learning outcomes of the programmes can be achieved.

In conclusion, the experts find several issues with the module handbook of each study programme under review. First, not all information in the module handbook is complete, e.g. in many cases the names of the responsible person is missing. Second, in many cases the given information is incorrect, e.g. the module “Final attestation” in the bachelor programme is mandatory, not as stated elective. Third, the content of the module description does often not reflect the content of the courses as discussed during the on-site visit. This caused much confusion on the skills and competences of the students and raised the questions if the programme learning outcomes of the programmes can be reached. Fourth, the discussion between the experts and the different partners (especially the programme coordinators and teaching staff) has revealed, several modules are missing in the module handbook. Fifth, the list of presented modules in the curriculum and the module handbooks does not equal the 240 ECTS credits points for the bachelor study programme or the 180 ECTS credit points for the three PhD programmes. In addition, the experts would advise the university to present study plans of each programme, which clearly illustrate the different paths students can choose during their studies. It needs to be verified, that all information is filled out in the module handbooks, including the responsible person for each module and an up-to-date reading list. Furthermore, the translations from Kazakh to Russian to English need to be consistent and should include the correct terminology in the different research fields. The module descriptions further require clear pre- and postrequisites and a clear explanation on the language of instruction.

International mobility

In order to ensure the international mobility of students, KazNU cooperates with universities and institutes abroad. Exchange programmes are available for one and two semesters as well as for international internships. The university states that it encourages their students to spend time at foreign universities. Following the Bologna process, ECTS credit points collected at other institutions can be transferred to KazNU. No data is presented for student mobility in the bachelor programme "Computational Sciences and Statistics" during the on-site visits.

In the three doctoral programmes under review, students took part in scientific internships abroad supported by their doctoral grants. Countries visited by the students include among others China, Italy, Latvia, Japan, Portugal, Russia, Turkey, USA, and the United Kingdom.

In addition, students from the PhD programme successfully completed their 12-months Erasmus+ internship in the United Kingdom and Portugal.

The experts discuss the international mobility of the students in the programmes under review. The students are aware of the possibility to go aboard during their studies. All students in the PhD programmes have one international advisor in addition to their supervisor at KazNU. All students in the PhD programmes remark that they have spent time abroad with their international supervisors (e.g. in Australia, Belgium, France Turkey, and the USA). The representatives from the rector's office substantiate that the university supports the international mobility of students and has signed more than 500 exchange agreements. The webpage of KazNU gives information on how to plan spend one semester abroad and how to plan one internship outside Kazakhstan. Moreover, the students of the PhD programmes state that they have to attend at least one international conference. They are free to choose the conference they wish to attend, however, the funding needs to be acquired by their research project, externally or paid by themselves. In the opinion of the students, younger students need to have a high grade point average to receive funding to go abroad. In addition, a certificate to prove the level of English proficiency is required, which appears to be the second biggest challenge for students. The students further confirm that they never heard about problems of transferring ECTS credits from universities abroad to KazNU as long as the contents of the module are similar.

The students further confirm to the experts that incoming students also visit KazNU. In this case, lectures in English are usually organized. In the recent years, students joined their programmes from Egypt and Afghanistan.

The experts confirm that the higher education institution promotes (international) student mobility through an appropriate framework (structural design of the degree programme, recognition of qualifications and support services). The experts consider especially the international advisors in the PhD study programmes as beneficial to the students.

Criterion 1.4 Admission requirements

Evidence:

- Self-assessment report
- Webpage KazNU https://www.kaznu.kz/en
- Discussions during the audit

Preliminary assessment and analysis of the peers:
The university has described the different admission criteria in their self-assessment report. The criteria differ for the admission in a bachelor, master and PhD programme. As per the University's Academic Policy document, admission is carried out in accordance with the "Standard Rules for admission to study in organisations implementing educational programmes of higher and postgraduate education", approved by order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated October 31, 2018.

To enrol in the bachelor programme, students have to take the "Unified National Test" (UNT) as a nationwide university entrance examination. Participants receive a certificate including a test score with which they apply at their desired university. Based on the received applicants' UNT results, KazNU, in accordance with the applicable regulations, determines the passing score for a given intake and admits applicants who pass the determined threshold. Additionally, students participate in the competition to receive an educational grant from the state of Kazakhstan. If the students are not successful in archiving state funding, they can alternatively register for a paid education. International grants by the government are available and calculated based on a quota. The acceptance of the students depends on their results of the initial test and the number of applications and capacity in the study programme.

To continue the studies in a doctoral programme, comparable competitive grants are available. This "Comprehensive Test" (CT) is conducted by the National Testing Center and is acknowledged by KazNU. Doctoral admissions at KazNU are decided upon by the University's "University Admissions Committee" based on the results of the CT in combination with subject-specific entrance exams. Funding is mandatory to enrol in a PhD study programme. Applicants for entering PhD studies moreover need to have at least nine months of professional experience to be eligible for admission and require a certificate in English language. Additional requirements may occur for single study programme.

Students can appeal the results of the examinations at the ministry of foreign affairs, which leads to a new consideration of the decision by an additional commission.

The experts ask the programme coordinators to explain the required competences of the students who want to enrol in the PhD programmes. In the opinion of the expert, especially the required competences of the applicants remained unclear. The programme coordinators apologize and describe the principles of these regulations during the on-site visit. They further describe that it is possible to change from one master to another PhD programme; if skills and competences are missing, the student has to take additional courses to complement their knowledge. The expert panel acknowledges these descriptions, but point out that these requirements are not presented to external stakeholders. The experts therefore consider it necessary to describe these requirements clearly and transparently on their webpages in order for everyone interested in studying at KazNU to be able to check if these application requirements are in agreement with their own education.

In conclusion, the expert panel considers the basic admission requirements and procedures as published on the webpage as adequate. They establish clear rules to ensure that students are in principle able to successfully graduate from the programmes. The regulations also include rules for the recognition of qualifications achieved externally (e.g. at other higher education institutions or outside the higher education sector), which are clearly defined. KazNU facilitates the transition between higher education institutions and with non-university places of learning without jeopardizing the achievement of learning outcomes at the desired level. However, the experts add that the admission requirements for the PhD programmes need to be improved in order to make the application process fair and transparent. Therefore, the admission requirements of each PhD programme need to be described in detail including the technical qualifications and skills as well as options to overcome missing prerequisites.

Criterion 1.5 Workload and Credits

Evidence:

- Self-assessment report
- Module handbook of each study programme
- Curricular overview of each study programme
- Statistical data on student progress
- Discussion during the audit

Preliminary assessment and analysis of the peers:

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

The bachelor programme "Computational Sciences and Statistics" awards in total 240 ECTS points in the entire programmes whereas all there PhD programmes comprise 180 ECTS points. The standard duration of study for the bachelor's degrees is four years (eight semesters), and for the PhD doctoral studies it is three years (six semesters). The module handbooks in each programmes list precisely the average workload in hours the students need to complete the module. The university states in their self-assessment report that the expected workload allows the students to achieve the planned learning outcomes in each module and within the study programme as a whole. The number of awarded ECTS credit points is under regular review by the university considering the student evaluations and their discussion with their advisors.

The university gives the following numbers of student success. They consider the low number of retakes and the fact that students remain in the average study time as an argument of an adequate workload in the four study programmes.

Program	Stage of study	Number of students	Average GPA	Number of debts	Number of retakes	Duration of study
Computational Sciences and Statistics	bachelor	162	2,69	31	0	4
Computational Sciences and Statistics	doctoral student	5	3,58	0	0	3
Pure and Applied Mathematics	doctoral student	14	3,73	0	0	3
Robotic Systems	doctoral student	22	3,59	0	0	3

The experts took a careful look at the curriculum and module handbook of each study programme before and during the on-site visit. This has revealed that none of the presented documents contains a consistent presentation of the workload of the students. The number

and total amount of ECTS credit per module and study programme showed a workload, which often exceeded the 240 ECTS credit points for the bachelor program and the 180 ECTS credits for the PhD programmes. Since the submitted documents are contradictory and the total number of credits could not be clarified during the discussion on site, the experts cannot verify if the workload for the students is adequate. Although the discussion with the students does not rise any immediate concern, the experts prefer to receive a correct and consistent documentation of the workload planned for each semester.

In summary, the expert panel confirms that a credit point systems is used in the all study programmes to express the students' workload. Credits are awarded for every module based on the respective workload. The estimated workload is realistic and well-founded, so that the study programmes can be completed in the standard period of study. The modules of each programme are regularly evaluated to whether the credits awarded for each module correspond to the actual student workload and whether the distribution of the workload across all semesters enables graduation within the standard period of study. Students are involved in these processes by participating in the evaluation at the end of each course. Nevertheless, the expert consider that KazNU needs to revise the presentation of the programmes as well as their total workload. This includes a revision of the presentation of the structure of the study programmes as well as the presentation of the workload. In addition, the workload of each modules needs to show transparently the total workload including hours spend in the classroom, during assignments and in self-study.

Criterion 1.6 Didactic and Teaching Methodology

Evidence:

- Self-assessment report
- Module handbook of each study programme
- Discussion during the audit

Preliminary assessment and analysis of the peers:

Teaching at KazNU is organized using modern techniques and methods to enable student learning. The modules contain both competence- and student-oriented parts and apply methods in which the students are actively integrated in the teaching process. The concept of the entire programme is well-balanced to teach the students technical competences as well as soft skills. Lectures are used to teach the students the theoretical foundations in one discipline, in particular to present derivation of equations, to present solutions to specific analytical, experimental or numerical problems. Demonstrations are included into the

lectures and involve giving students several problems to solve in a certain amount of time. Therefore, the university aims to keep their lectures interactive.

The bachelor programme “Computational Sciences and Statistics” modules are primarily organized as a combination of lectures and seminars. Inside the seminars, students have to work on case-studies or are involved in discussions. Many additional modules focusing on mathematical, computational and statistical methods further contain work in laboratories, especially as elective components. Modules on languages are completely organized as seminars (modules “Foreign language” and “Kazakh (Russian) language”). The students further have to complete the module “Physical training” as a mandatory module in the curriculum. Additional practical modules are “Professional (educational) Practice” allow the students to gain experience in the application of their theoretical knowledge. The use of didactic tools and methods to achieve the planned learning outcomes within the framework of the educational programme contributes to form the ability to apply modern methods of computational mathematics and statistics. Students shall learn to analyse numerical results and statistical data, and be able to visualize the relevant processes, compile mathematical models of the object under study based on the principles and tools mathematical methods.

Teaching methods in the PhD programmes often involve a combination of lectures and seminars. Only the module “Academic writing” is conducted as a seminar in all three study programmes. In the PhD programme “Computational Sciences and Statistics”, the module “Research Work” is also organized as a seminar whereas the modules “Research work” taught as a combination lecture and seminar in the other two PhD programmes. In addition, the module “PhD thesis writing and defence” is organized as a combination of lecture and seminar in all three doctoral programmes. In the PhD programmes “Computational Sciences and Statistics” and “Robotic systems”, the majority of all modules are organized in a combination of lectures and laboratory work.

All educational programmes are created with the aim to balance the contact hours of students with their self-study time. This should foster the students’ skills in independent work. Students, especially in the PhD programmes further receive training and the opportunity to speak at conferences and publish their scientific work. In the classroom, both classical lectures and innovative teaching methods are combined, such as lecture-dialogue, master classes by leading experts, field classes, round tables, competitions, analysis of specific situations, presentations, and preparation of a report.

Lectures are mainly using a syllabus and the online platform “Univer.” This allows the students to have access to the syllabus of each module, which also clearly state the teaching methods applied in this module. Additional guidelines are available for laboratory work and practical classes. In the PhD programme “Robotic systems”, practical classes are integrated

to give the students the opportunity to deepen their practical knowledge, solve problems in a practical manner and work on applied problems in cooperation with the teacher. These professional skills are regarded as extremely important by the university.

The experts discuss the applied teaching methods with the teaching staff. In particular, the experts are interested in the teachers' understanding of a seminar and its difference to lectures. The teaching staff explains that in a seminar, the students receive a problem, which they have to solve. The complexity of the problem varies; in some cases the students have to develop a solution in the same afternoon in other cases the problem-solving process can last for weeks. Group work is integrated and usually done in teams of three to four students. Seminars often include discussion and group work followed by presentations in oral from in front of the class. The teaching staff summarized that all seminars are considered as interactive while in the lectures, the students mainly listen to the teachers. In their module handbook, a lecture refers to classical frontal teaching, which is combined with smaller students' tasks and discussions only. Usually, the modules are organized in a mixed form between lectures and seminar or practical/lab work.

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

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

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

Add 1.2.

The university explains in their statement that they considered all names of the study programs are justified by their learning outcomes. They explain, that the bachelor program "Computational Sciences and Statistics" offer various modules in statistics making up to 45 ECTS credit points in total. Further courses on advanced statistics are available in the doctoral programme. In both cases, the expert panel identify a clear focus on the programmes

on computational sciences. The experts are aware of the courses on statistics in the bachelor programme; however, they point out that all courses are available as electives. Therefore, there is no common modules for all students of "Computational Sciences and Statistics", where they learn the basics in statistics. In the experts' opinion, mandatory lectures in statistics need to be part of the curriculum in order to justify the name of the study program. This further applies as well to the PhD programme "Computational Sciences and Statistics." The experts add that the courses for each specialization (computational sciences or statistics) need to be clearly presented in both study programmes. It has to be guaranteed that a reasonable set of electives is actually chosen.

Concerning the PhD study programme "Robotic Systems", the university defends the chosen name by listing several competences the students learn in this programme. The experts acknowledge the content of the problem, but continue to point out that the curriculum mainly focuses on robotics not on robotic systems. The experts insists, that there are clear differences between these two fields and this needs to be reflected in the name and learning outcomes of the study programme.

Since in both cases, the university had not made any changes yet, the experts continue to issue the requirement A1 as well as A2.

Add 1.3.

The university has provided a new overview table for the bachelor programme "Computational Sciences and Statistics." The experts confirm that the presentation of the study programme is an improvement; nevertheless, the number of electives as well as their workload is still not very clear to people interested in the study programme. The expert panel emphasizes that it is essential that the presentation of the study plan is consistent in all documents and platforms. Since inconsistencies still occur within the presentation of the study plan as well as several issues concerning the module handbook, the expert panel still supports the requirements A2 and A4. Furthermore, KazNU did not comment on the improvement of the clarification of the scientific level in the module descriptions, thus the recommendation E1 remains in place. In addition, so comments by KazNU were received on the recommendations to improve the curriculum. Therefore, the recommendations E6, E7 and E8 stay in effect.

Add 1.4.

The university did not submit documentation on the admission requirements of the PhD programmes under review. The experts therefore continue to issues the requirement A9.

Add 1.5.

The experts did not receive updated module handbooks for review after the on-site visit. The experts cannot confirm the student workload, particularly their self-study hours. As a consequence, the requirement A5 remains in place.

2. Exams: System, Concept and Organisation

Criterion 2 Exams: System, concept and organisation

Evidence:

- Self-assessment report
- Module handbook of each study programme
- Sample of Examination Papers and Final Theses provided during the audit
- Discussion during the audit

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

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

The standard assessment methods of KazNU apply a 100-point scale. Students who fail to pass a course may retake the course, subject to the applicable reasons and regulations (e.g. previously failed examinations, violation of exam conditions, etc.).

Letter Grade	Grade Point Value	Percentage	Conventional Grade
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good
B	3,0	80-84	
B-	2,67	75-79	
C+	2,33	70-74	
C	2,0	65-69	Satisfactory
C-	1,67	60-64	
D+	1,33	55-59	
D	1,0	50-54	
FX	0,5	25-49	Failure
F	0	0-24	
I (Incomplete)	-	-	"Incomplete" (shall not be taken into account when calculating GPA)
AU (Audit)	-	-	"Audit" (shall not be taken into account when calculating GPA)
Cert.	-	30-60 50-100	"Certification" (shall not be taken into account when calculating GPA)
Uncert.	-	0-29 0-49	"Uncertification" (shall not be taken into account when calculating GPA)
R-difference	-	-	"Discipline difference on curriculum" (shall not be taken into account when calculating GPA)

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

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

During and after the on-site visit, several sheets with examination questions were presented to the expert panel. These questions, however, did not give a good overview on the actual examinations the students receive in any of the four programmes under review. New examples of examination of all four study programmes were submitted after the on-site visit. The expert panels considers the examinations presented for the three doctoral programmes as adequate. The examination sheets presented for the bachelor programme "Computational Sciences and Statistics" do not give a sufficient overview of the examinations in the programmes and therefore leave several questions open. The experts were mainly presented with questionnaires showing only multiple-choice questions, which does not suit the level of a bachelor thesis. Therefore, the experts argue to ensure that all questionnaires in the bachelor programme should be reviewed in order to ensure that these are competence-oriented and suitable for a bachelor programme. Furthermore, the form of examinations needs to be aligned with the intended learning outcomes of the module.

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

Nevertheless, the experts raise concerns on the level and quality of the examination methods in the bachelor programme as well as the PhD programmes considering the quality and scientific level of the examinations.

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

The university did not submit any statement concerning the examinations in all study programs. Therefore, the recommendation A6 remains unchanged.

3. Resources

Criterion 3.1 Staff and Development

Evidence:

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

Preliminary assessment and analysis of the peers:
The staff at the department of Computational Sciences and Statistics has 20 staff members of which four hold a doctorate, eight are candidates for PhD and four hold a PhD degree. Therefore, 80% of the staff in the department has experience in doctoral studies. The teaching staff for the PhD programme Pure and Applied Mathematics consists entirely of lecturers from the Institute of Mathematics and Mathematical Modelling from the National Academy of Sciences of the Republic of Kazakhstan. The staff at the Institute of Mathematics and Mathematical Modelling consists of 50 professors, who all have a doctoral degree. All employees of this institute can potentially teach within this programme after considering their qualification and teaching potential. The PhD programme "Robotic systems" is associated with the department of robotics and mechatronics. The entire teaching staff consist of thirteen members, who all hold a doctoral degree. Some of these staff members are affiliated with the National Academy of Sciences of the Republic of Kazakhstan.

All staff members of these programmes are involved in teaching as well as research in fundamental and/or applied fields of their discipline. All of the staff members regularly apply for external funding. Undergraduates are also involved in these research projects.

The university has issued a general policy and strategy for the quality assurance and development of its teaching staff in alignment with the university strategy. This includes special requirements for hiring new staff, changing positions inside KazNU, and personnel management. The selection of staff is based on an analysis for the needs of the educational programmes. Recruitment of new staff is controlled by a competition commission, who operates in accordance with the rules and regulations defined by KazNU.

Staff members of all programmes are encouraged by the university to continue their education. The Institute offers courses for Advanced Studies and Further Education at KazNU offers specific courses such as "Teaching methods and assessment of student's knowledge." The International Society for Engineering Pedagogy offers additional opportunities including "Engineering Pedagogy. The university supports their advance training of the teaching staff, including "refresher" courses.

Further staff development takes place at international conferences, seminar, and short-term internship at national and international partner institutions.

The representatives of the rector's office discuss with the expert panel their strategy on recruiting new staff. They explain that job opportunities are transparently presented on the webpage and additional sources and that everyone is welcome to apply. Currently, hiring new staff follows strict government guidelines. However, KazNU is working on reaching a status of an "autonomous university", which would grant them a higher freedom in the recruitment of new personnel. To become a professor at KazNU, the university expects a high education (requires a PhD) and a strong scientific records (h-index, publication record, research grants, etc.). In addition, attention is paid on the role of the applicant in education as well as in the development and usage of various educational tools.

In the discussions with the programme coordinators and the partners from the industry, the experts learned about the strong connections between KazNU and the National Academy of Sciences of the Republic of Kazakhstan. While the bachelor programme "Computational Sciences and Statistics" is taught by lecturers from KazNU, the modules from all PhD programmes are partly ("Computational Sciences and Statistics" and "Robotic systems") or entirely ("Pure and Applied Mathematics") lectured by members of the National Academy of Sciences. The lecturers from the Institute are commonly involved in teaching at different universities across Almaty, although their main focus lies on research. Therefore, they usually have several research projects, in which the students are also integrated. The teaching staff affiliated with KazNU confirms to the expert panel that they have a higher teaching load in comparison to their colleagues at the institutes at the National Academy of Sciences. On average, they teach around sixteen hours per week or up to 40 ECTS points per year (equal to 460 hours). In contrast, only around ten hours remain for research at the university. This absolute number varies between the lecturers, but in general, they spend twice as much time on teaching than on research. To improve the teaching load, the teaching staff is trying to develop new regulation as a technical policy. The expert panel strongly supports a reduction of the teaching load of the members of the teaching staff at the faculty. The experts suggest several methods of reducing the teaching load such as sharing modules among study programmes. As one example, they name the module "Academic writing" which is currently mandatory in all three PhD programmes and taught by different lecturers in each programme. Since the number of PhD students in some semesters is very low, one lecturer could teach students from several programmes. Other examples would be to allow students to take courses from other study programmes as elective courses. This would allow the students to broaden their knowledge and gain skills outside their core discipline as well as reducing the teaching load in particular in the PhD programmes. Inviting

guest lecturers from the industry partners to support the lecturers in other modules would be another example to support the teaching staff.

In the discussion with the students, the experts raise also the question of student support by their lecturers. In general, the students report feeling well-supported by their lecturers and supervisors of the bachelor and doctoral theses. In their bachelor studies, twelve students share one student advisor whom they can contact with any sort of issues to support them navigating through their studies. These student advisors are the main guidance for the students next to the information available in the online system "Univer." Since twelve students share one advisor, the students often bond within their own group and start to support each other as well.

The expert panel further raises the issue on international mobility and personal further education of the teaching staff. The teaching staff state that it is common to go abroad for internships or project collaborations between three months and one year. They add that they visit international conferences on a regular basis, which are funded by their research grants. This is similar among lecturers from KazNU as well as the institutes from the National Academy of Sciences. However, they add that longer stays abroad are more difficult for lecturers from KazNU as their teaching load is higher and takes places on a regular basis. Several members of the teaching staff have further confirmed their participation in continued education. This includes international courses in professional pedagogy in Israel and India. In addition, several lecturers also state to work in international research projects.

Summarizing, the expert panel recognizes the strong identification of the teaching staff with the study programmes. The composition, professional orientation and qualification of the teaching staff are suitable for successfully delivering the degree programme. The research and development of the teaching staff contributes to the desired level of education and allows the students to develop their abilities in research. The experts form the opinion that the teaching staff has the opportunity to further develop their professional and didactic skills and is supported by their departments to continue their personal higher education. However, the expert panel identifies the high workload of the teaching staff, particularly at KazNU. The experts recommend developing strategies to improve this situation to enable the entire teaching staff to conduct research. Furthermore, the experts are concerned about the level of English of some members of the teaching staff. A good level of English language in teaching is especially important for the three doctoral programmes under review. Therefore, the expert panel considers it necessary to raise the competence level of teaching in English with respect to the teaching quality. In addition, the various discussions during the on-site visit revealed that there is a certain lack of communication within KazNU. The experts therefore recommend increasing the transfer of information between the programme coordinators, the teaching staff and other university institutions,

including the Center for Training of Scientific Personnel "Gylym Ordasy." Furthermore, the communication should also be improved between the lecturers and programme coordinators to committees and boards that are relevant to the programmes. The experts consider this essential to improve the communication between these different parties to ensure the quality of the study programmes.

Criterion 3.2 Funds and equipment

Evidence:

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

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

KazNU offers a central library and information centre with reading rooms, study areas and a museum. Staff and students have additional access to the electronic library, which offers access to digital reading material, software and a zone for working with electronic resources. Access is granted for everyone via their online library, where scientific journals of the main publishers can be accessed, including as examples Web of science, Springerlink, Elsevier, Scopus and additional Russian directories. Necessary training to access is available in the online system of KazNU. Furthermore, the library houses further historic collection of books and manuscripts dating back to the 16th century, of which some a presented in a small museum.

The university uses the electronic platform “Univer 2.0” as a central information source. Univer is an educational process management system, which offers digital workspaces for

each employee. All study programmes at KazNU are organized using this system, which allows managing among other things the admission, curriculum and syllabus, student files, registration to modules and exams, examination scores or the study passport.

Laboratories are especially important for the doctoral programme “Robotic systems.” The equipment of the material and technical base provided by the university allows the students to conduct their educational process and guarantees possibilities to conduct their own research. Lecturers and students have further access to the scientific and educational centre “Digital technologies and robotics” at the university’s technopark as well as the laboratory at the Dzgoldasbekov Research Institute of Mechanics and Engineering at the National Academy of Sciences of the Republic of Kazakhstan.

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

The programme coordinators further explain to the expert panel that the university receives special grants for each study programme. Therefore, the university has to compete with other universities for grants, including new grants to initiate the educational programmes under review. Only after successfully acquiring governmental funding, the university is allowed to open new study programmes. Furthermore, the programme coordinators clarify that competition exists also for the PhD grants. The university has to apply for PhD grants at the government. The government separates these grants based on their discipline; therefore interdisciplinary study programme, such as the programmes on “Computational Sciences and Statistics” can theoretically apply for two different grant schemes.

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

Therefore, the experts confirm that the financial resources and the available equipment at KazNU are suitable to operate the study programmes under review. This includes a secure

funding and reliable financial planning, sufficient infrastructure in terms of both quantity and quality as well as binding regulation of internal and external cooperation.

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

The university did not comment on the recommendations E2, E3, and E4. Therefore, all of them are issued without any changes.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Evidence:

- Self-assessment report
- Module handbook of each study program
- Webpage of the Ba program „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/bachelor/speciality/2209
- Webpage of the PhD „Computational Sciences and Statistics“ https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/2044
- Webpage of the PhD “Pure and Applied Mathematics” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1846

Webpage of the PhD program “Robotic systems” https://welcome.kaznu.kz/en/education_programs/doctorate/speciality/1937

- Discussion during the audit

Preliminary assessment and analysis of the peers:

In the attachment to the self-assessment report, KazNU has presented a module handbook for each of the study programmes under review. The university additionally uses a syllabus, which is available for all students within the “Univer” system. Short description of all elective and compulsory modules are further available on the webpage of the study programme.

The experts conclude, that the current level of presented module handbooks is inadequate and do not sufficiently represent the study programmes. First, not all information in the module handbook in complete, e.g. in many cases the names of the responsible person is missing. Second, in many cases, the given information is incorrect, e.g. the module “Final

attestation" in the bachelor programme is mandatory, not as stated elective. Third, the content of the module description does often not reflect the content of the lecture as discussed during the on-site visit (see criterion 1.3). This caused much confusion on the skills and competences of the students and raised the questions if the programme learning outcomes of the programmes can be reached. Fourth, the discussion between the experts and the different partners (especially the programme coordinators and teaching staff) has revealed, several modules are missing in the module handbook. Fifth, the list of presented modules in the curriculum and the module handbooks does not equal the lists 240 ECTS credits points for the bachelor study programme or the 180 ECTS credit points for the three PhD programmes. Moreover, inconsistencies occur between the English translation of module description and descriptions available in Kazakh or Russian. In some cases, the English translation does not represent the current scientific terminology, which needs to be improved. Therefore, the experts consider the currently presented module handbooks as not adequate and require improvements. The module descriptions need to contain information on the module title, the person(s) responsible for each module, the teaching method(s), the credits and workload (classroom, assignment and self-study), intended learning outcomes, the module content, the admission and examination requirements, the form(s) of assessment and details explaining how the module mark is calculated, recommended up-to date literature as well as the date of last amendment made. Furthermore, the information presented in the module handbooks needs to be consistent among all presentations of the study programmes on various platforms and in all documents. In addition, the module handbooks needs to be publicly available for all stakeholders; the experts suggest therefore publishing the module handbooks on the webpage of the university/faculty. To increase the transparency of the study programmes, the experts suggest adding a clear study plan for all students, including information on all possible study tracks/specializations. This information should be comprehensively presented on the webpage for everyone interested in the study programmes. If it is intended to offer all courses in English, as it is written in the module handbooks, then this information has to be available in English as well.

Criterion 4.2 Diploma and Diploma Supplement

Evidence:

- Self-assessment report

- Transcript of record provided during the audit
- Discussion during the audit

Preliminary assessment and analysis of the peers:
The university states that shortly after graduation, each students receives a diploma together with a diploma supplement and a transcript of records. Documents are issued in Kazakh, Russian and English. The transcript of records lists each module of the programme (name and code are provided), the amount of credits awarded for the module, the number of hours of this module and well as the grade. Each module is further separated to the semester in which it was completed. Internships are listed showing the period of practice, awarded credits, workload hours and grade. The grading system is explained to third parties.

The university submitted examples for diploma and diploma supplement as no graduates are yet available from the programmes under review. The submitted diploma supplement provide information on the student's qualifications profile and individual performance as well as the classification of the degree programme with regard to the respective education system. The marks of individual modules are presented and the way in which the final mark is calculated is explained. In addition to the final mark, statistical data as set forth in the ECTS Users' Guide is included to allow readers to assess the individual mark. The added ASIIN logo on the diploma supplement, however, it should be removed the opinion of the experts.

Criterion 4.3 Relevant rules

Evidence:

- Self-assessment report
- KazNU webpage https://www.kaznu.kz/en
- Discussion during the audit

Preliminary assessment and analysis of the peers:
The university describes to the experts that the organisation of the study programme is supported by the online platform "Univer." Within this system, students can access their study plan as well as the syllabus of each module. In addition, all rules and guidelines can be viewed and downloaded in this system. The rights and obligations, such as guiding principles, regulations, and charters, are available on their webpage for all third parties. Basic information on all courses offered at KazNU are presented on the webpage as well.

In the discussion between the students and the expert panel, the experts ask how well the students know their rules and regulations as well as their study plan. While the PhD students appear to have a good understanding of the structures of the university and know where to find information, the bachelor students lack such clear oversight. This does not only include where to turn to if they have questions and problems, but the students also admit they are uncertain of their entire study plan as well as bachelor thesis. The main source of information for young students seems to the "Univer" system, which gives them their study plans for each semester, but also contains all rules and regulations of the university. The students confirm to the experts that the system is very well structured and they can access all information necessary inside this online system. Although this appears to be sufficient in the students' opinion, the experts consider the university could improve the introduction of freshman students to their university structure and systems as well as their rules and regulations.

In addition, students are aware about the obligations in each course. The students describe to the expert panel that presence if required in all courses at KazNU. If they miss one class, the students have to self-study the missed content of the lectures. Since all learning materials are available in the university online system, the students are satisfied with this situation.

Upon inquiring about regulations concerning students with special educational needs, the experts learn that appeals can be submitted to the faculty in such cases, e.g. if needing to attend classes remotely due to being unable to come to the campus. Classroom materials are uploaded to an online learning management system, and can hence be accessed from anywhere.

Therefore, the expert panel considers the rights and duties of both the higher education institution and students are clearly defined by guidelines and statutes. Except for the module handbook, all relevant course-related information is available in the language of the degree programme and accessible for anyone involved. The expert panel confirms that relevant documents such as the University's Academic Policy, students' and staff's rights and duties or quality management guidelines exist and are published publicly on the university's website. However, the expert panel considers that the PhD study programmes are not well represented on the webpage for all stakeholders including students who are interested to study at KazNU. In the experts' opinion, the presentation of each doctoral programme online should include detailed information on the admission requirements, the course of study with different tracks/specialisations, graduation requirements and students' professional orientation regarding possible areas of occupation after graduation. The presented information needs to be consistent in all platforms and documents. The ad-

mission requirements should clearly state the necessary technical skills to enter the programmes as well as possibilities to complement skills in e.g. additional courses (see criterion 1.4). In addition, the experts consider important to transparently present the involvement of additional parties to the study programmes. In this case, this refers to the collaboration with the National Academy of Sciences of the Republic of Kazakhstan. The experts currently consider that the presented documents on the collaboration between KazNU and the institute of the National Academy of Sciences do not sufficiently cover all types on information. In particular, important topics are not specified in the contract. This includes the question on who is responsible for the structure, content, quality management and graduation in each of the three doctoral programmes, especially in the programme "Pure and Applied Mathematics" which is entire taught by external lectures. A clear and comprehensive paragraph or provision should be included in this contract. The contract needs to name the responsible party on these issues to guarantee the quality of education. Further, the contract should contain a provision on what happens if the standard of education is not adequate, e.g. if the teaching in one module or the supervision of a doctoral thesis falls below a desired standard. Similarly, a provision should name the responsible party for continued development of the programmes and updates in the curricula of these programmes.

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

Add 4.1.

The university clarifies, that information on each module is available for all study programmes on their webpage. The experts can access this information and need to point out that the information on the current webpage is not sufficient. Currently, only short descriptions are presented online, but not the entire module handbook. The experts insists, that the all information presented in the module handbook needs to be available online for all third parties. Therefore, it would be most convenient to present the entire module handbook online or make it available for download. The recommendation A7 remains in place.

Add 4.3

The university has submitted a translation of their contract with the National Academy of Sciences of the Republic of Kazakhstan for review. The experts read through the contact and consider the contract is vague on important issues, especially on the responsibility of the structure, content (curriculum), quality assessment and graduation. The discussion with KazNU during and since the on-site visit has not answered these questions with certainty. The experts are further not sure, about the consequences if problems occur with these

topics. The experts, therefore, continue to support the requirement A11. In addition, no comments on the requirements A10 were received, which remains in place as well.

5. Quality management: quality assessment and development

Criterion 5 Quality management: quality assessment and development

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the peers:
KazNU has issued a quality assurance policy, which defines the concepts, procedures and criteria to ensure the quality of teaching and learning. As a national university, KazNU has to follow guidelines by the Republic of Kazakhstan and the Ministry of Science and Higher Education. The internal quality assurance policy of KazNU complements the state regulations; the university has issued several additional documents such as an academic policy, policy of academic honesty, policy for assessing learning outcomes and regulation on the procedure for the development and approval of educational programmes. These regulations are intended for the members of the Academic Committees, the Academic Council, managers and employees of the structural divisions of the University, as well as other interested parties.

The internal quality assurance policy summarized the various approaches taking place inside KazNU. On a higher level, the Academic Committees, development of the educational programmes and the Academic Council release suggestions, which have to be implemented by the administration and teaching staff. The main task of these bodies is to ensure that the content of each educational programme contains the latest developments in this field, considering international research as well as research at KazNU. This includes both, theory and practice (methods, laboratories, etc.). This internal evaluation considers among other things, the demand on the labour market, the fulfilment of the learning outcomes at graduation in reference to the Qualification Framework, the transparency of all processes of teaching, learning and evaluations, to provide the graduates the academic knowledge and necessary skills (including soft skills) to work in their future occupations, and to affect the personal development of each student. Thus, each educational programme is under con-

stant monitoring in a three to five year cycle. Annual revision of the educational programmes are performed during autumn, in which data is collected and analysed. If the need for change is evident, implementations take place in the following year. Reports are forwarded to the members of the board (Vice-Rector of Academic Affairs, Academic Council) for the decision process.

The main tool to ensure the quality control of their classes and teachers is the evaluation by students. The surveys uses online questionnaires inside their "Univer" system. Students grade their teachers with 1 to 5 points on 25 categories concerning aspects such as study material, appearance of the teacher, corruption, teaching quality, relevance of content, etc. The results are controlled by the chair and regularly discussed with the respective teachers who always have access to all detailed results of their evaluations. A calculated average total grade is made public on the teacher's website in order to guarantee transparency. If the general grade is below 3 a discussion with the chair is compulsory and improvement measures are agreed on. In this case, the students are informed about the consequences of their survey. These evaluations take place each semester.

Surveys among other stakeholders are also be conducted. Questionnaires are send to employers to evaluate their satisfaction with the competences of the graduates on the labour market. In addition, new questionnaires among recent alumni are currently developed to verify the satisfaction of their entire study progress at KazNU.

External quality assurance at KazNU involved institutional and specialized accreditations, consideration of the institutional ratings of the university and each study programme and a certification of the quality management system.

The representatives of the rector's office describe during the on-site visit that each faculty has their own Academic Committee, who is responsible for the quality assessment of the study programme. They are also the group in charge to organize the different kinds of evaluations, analyse the results and initiate improvements in the quality of the programme. Answering the questions of the expert panel, the representatives of the rector's office confirm that all surveys are conducted anonymously. The majority of surveys are done online. The representatives of the rector's office further state that external stakeholders are also integrated in the quality assurance processes and receive their own questionnaires. The industrial partners of the university confirm that they receive requests to review the study programmes and their curriculum. According to the industrial partners, there are no meetings with the university; however, they send an official letter for a programme or curricular review.

The results of the survey presented to the experts show very high satisfaction of the students of both their modules and their lecturers. Therefore, the experts raise this issue in

the discussion with the students. The students confirm to the experts that they are indeed very satisfied with their teachers. Moreover, the students confirm that they receive questionnaires at the end of each lecture in order to evaluate modules. This survey is done online before they can see their final grade on a course. The students confirm that the same surveys are also included in courses with only few students. The students add that they can skip these evaluations if they wish to do so. During the past years, the students have also witnessed improvements requested in these evaluations. They admit, change are not possible in the same semester, yet they took place in the following semester.

In addition, the expert panel is further interested in which university bodies the students are represented. The students explain that at KazNU there is a student organisation called the student government, who are regularly involved in questions of quality assurance of their study programmes. If problems arise, the students would first contact the dean of the student organisation to report the problem. In the students' personal experience, reporting a problem to the student dean had previously had a positive impact on the study programmes. Examples described improvements in the access to laboratories during free time. An additional group within the student government is further responsible for requesting improvements in the curriculum.

Overall, the expert panel has a positive impression of the quality assurance system at KazNU. They consider that the university conducts a sufficient number of evaluations to survey the opinion of students and stakeholders on a regular basis. The results of these processes are incorporated into the continuous development of the programmes under review. The results and any measures derived from the various quality assurance instruments used (various survey formats, student statistics, etc.), which in turn take responsibility to verify of changes were implement through their student government. The expert panel adds, that it would be beneficial if the results of the evaluations would be directly communicated with the students who attended the module in order to inform them if their requested improvements are feasible and explain if they cannot be implemented. Furthermore, the experts suggest creating a new independent board or body inside the university, which is available to staff and students to address their complaints.

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

The university did not comment on the feedback of the results of the evaluations to the students or the need to create an independent board for complaints. The experts therefore still support the requirement A8 and the recommendation E5.

D Additional Criteria for Structured Doctoral Programmes

Criterion D 1 Research

Evidence:

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

Preliminary assessment and analysis of the peers:
The university describes that doctoral students in all three study programmes under review are actively conducting research. Between 2018 and 2021, this has led to fourteen scientific publications in international journals (Scopus, World of Science). Students also participate in international symposia and conferences, where thirteen contributions were also published. In addition, four patents were registered.

The number of students in each doctorial programmes varies in each semester and might range from two new students to eight in the programmes “Computational Sciences and Statistics” and “Pure and Applied Mathematics.” The numbers of students are higher in the PhD programme “Robotic systems”, ranging between eight to 23 students per semester. A lecturer at KazNU and an international expert supervises the students’ scientific work. Therefore, domestic and international scientists work together to educate and guide the students in their process toward becoming independent scientists.

All doctoral programmes are required to follow their independent work plan and submit reports on their progress each semester. The feedback from their supervisors have to be stored to document their personal progress. Because the educational programme was opened only in 2021, there are no published dissertations yet.

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

Criterion D 2 Duration and Credits

Evidence:

- Self-assessment report
- Discussion during the audit

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

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

Criterion D 3 Soft Skills and Mobility

Evidence:

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

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

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

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

Criterion D 4 Supervision and Assessment

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the peers:
Within the doctoral programmes under review, each student has at least two scientific supervisors during their studies. One supervisor has to be based at KazNU while the second supervisor needs to be from a foreign educational programme with experience in issuing PhDs. These supervisors are involved in the development and approval of an individual work plan for each student considering their scientific research topic and skills. They mentor and guide the student's work during the preparation of the doctoral dissertation, monitors the quality of the student's research work, encourages participation in scientific projects and the publication of the results.

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

The Doctoral programme is completed with passing all scheduled exams, preparation and defence of the doctoral dissertation.

Criterion D 5 Infrastructure

Doctoral candidates are provided with an adequate research environment that allows them to appropriately carry out their research projects.

Evidence:

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

Preliminary assessment and analysis of the peers:

KazNU offers their doctoral students access to laboratories to learn skills and perform their own experiments and scientific work. The university state that over the past 10 years, they have created a modern laboratory base that allows you to set up unique experiments, explore and obtain excellent scientific results. Laboratories are especially important for the students of the PhD programme “Robotic system” who collaborate with the National Academy of Sciences and other university concerning their laboratories.

Criterion D 6 Funding

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the peers:

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

Criterion D 7 Quality Assurance

Evidence:

- Self-assessment report
- Discussion during the audit

Preliminary assessment and analysis of the peers:

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

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

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

E Additional Documents (16.05.2023)

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

1. A new study plan for the bachelor programme and a complete updated module handbook - naming all responsible persons and including all elective modules even if they are not taught currently.
2. A clear structuring of the PhD programmes showing meaningful choices (tracks) of elective modules for the different areas of specialization and a matching list of job opportunities for the graduates.
3. For each programme, detailed tables showing the sequence of modules with a correct summation of credit points (improve and update the tables giving at the beginning of each module handbook).
4. A flow chart of the different paths through the study programmes from Bachelor to PhD showing the necessary qualifications for admission and possible additional requirements (modules to be taken in addition).
5. Regulations of the PhD programmes. These should include:
    a. Entry requirements for the PhD programmes giving details on the specific entrance requirements and possible additional qualifications to be gained by the applicants before (modules, work, ...)
    b. A clear up-to-date definition concerning the required scientific publications for graduation.
    c. Structured guidelines for applicants of each PhD programme.
6. Diploma Supplements for each study programme according to the guidelines by ASIIN.
7. Examples of theses and written exams for the core modules for all programmes (the experts were shown only documents for Robotic Systems). Protocols of oral examinations are also acceptable for the PhD programmes.
8. Rules and regulation (cooperation agreement) between the University and each external research institute including teaching agreements. The rules and responsibilities for every aspect of a joint programme (study plan, module responsibilities, selection and changes, admission, graduation, teacher selection, quality assurance, …) have to be clearly presented.

All documents should be up-to-date and show the current state of the respective programme. If changes are planned or required by some institution, such as the ministries, then this should be indicated together with the planned time span.

F Comment of the Higher Education Institution (30.05.2023)

The institution provided the following detailed statement

"**Responses to comments**

Criterion 1.2 Name of the degree programme

1. Comment. During the discussion on the content of the study programmes in reference to the name of the content of the curricula, several issues arise with different discussion partners. The experts state that the extent of statistics in the curricula presented for the bachelor and doc-toral program "Computational Sciences and Statistics" is not sufficient to justify the name of the study program. Since the discussion with the programme coordinators and the industrial partners revealed a strong desire to foster statistics in Kazakhstan, the experts acknowledge their point of view. Nevertheless, the content of the study programs has to match the name of the study program, which is currently not substantiated.

Response

The undergraduate program provides a basic mathematical education. With the help of profile and elective disciplines, two trajectories are given: computational science and computational statistics. Elective disciplines in computational statistics: Mathematical models in economics (5 credits), Introduction to Stochastic Analysis (5 credits), Time Series Statistics (5 credits), Applied Statistics (5 credits), Stochastic Models and Applications (5 credits) Statistical analysis (5 credits), Nonparametric statistics (5 credits), Fundamentals of Statistical Data Science (5 credits), Markov random processes (5 credits). This is 45 credits out of 240. Also profile disciplines: Mathematical Statistics (5 credits), Applied tools of Computational Sciences and Statistics (5 credits), Machine Learning (5 credits). That's 15 more credits. The program was drawn up taking into account the opinion of employers and we consider the

name of the program reasonable, because the learning outcomes in these disciplines correspond to the goals and objectives of the educational program.

In the doctoral program, the disciplines Big Data & High Performance Statistical Computing (5 credits), Advanced Statistics (5 credits), Intelligent systems for monitoring and forecasting processes (5 credits) are studied by doctoral students who choose the direction of computational statistics.

2. Comment. A misunderstand is further evident in the name of the PhD study program "Robotic system." Although the presented curriculum suggests a focus on robotic systems, the discussion with all partners and the visitation of the laboratories indicate a focus on robotics instead. The experts therefore can currently not fully comprehend the origins of the titles of the study programmes and insist also in this case that the content and title of the study program need to match. Thus, the expert panel insists that the curriculum and the learning outcomes need to be in alignment with the title of the study programmes for the bachelor study program "Computational Sciences and Statistics" as well as the doctoral study programs "Computational Sciences and Statistics" and "Robotic systems". The expert panel suggests to either adapting the content of the curricula to justify the name of the study program or change the title of each educational program.

Response
The educational program "Robotic Systems" was drawn up jointly with the Institute of Mechanics and Engineering named after academician U.A. Joldasbekov, as well as taking into account the opinion of employers. We consider the name of the program justified, as it fully corresponds to the terminology used in modern engineering and involves the training of doctoral students with competencies in the field of robotic systems. Research work of doctoral students and laboratory works on the disciplines that are performed in the laboratories of the research institute and the university are devoted to the dynamics, strength and reliability of machines, robots and robotic systems; vibrations in mechanical and robotic systems; machine learning and design of robotic systems; intelligent robotic systems; mechanics of robots and robotic systems; automated design of machines, robots and robotic systems; control of robots and robotic systems and others.

3. Comment.

In addition, the experts noticed an inconsistent use of English translations for all programmes. In particular, a confusion exists about the names "Computational Sciences and Statistics" and "Computational Science and Statistics." While the self-assessment report

and the webpage of the university mainly use the name “Computational Sciences and Statistics” several documents list the alternative name including “information on the employment of graduates” or “Scientific cooperation with organizations/universities.” Although the submitted documents for the doctoral program “Pure and applied mathematics” are consistent in their use of a program title, during the on-site visit several labels and descriptions used the name “Fundamental and applied mathematics”, which should be avoided in the future.

Response
Yes, indeed, on the site in some places there was an incorrectly translated name of two programs. We have corrected all these errors. And in the future we will stick to one name in the documents.

Criterion 1.3 Curriculum

1. Comment. The experts further note that in the self-assessment report, multiple representations of the curriculum of the bachelor program “Computational Sciences and Statistics” were presented; however, none of the available structures would result in the 240 ECTS credit points as initially stated in the overview charts and the webpage. Furthermore, the discussion with the programme representatives that changed in the curriculum will be implemented in a few weeks. The experts clarify that any changes of the curriculum must be communicated with the accreditation agency. Therefore, the university has submitted the new curriculum for review after the on-site visit. Nevertheless, the presented overview does not allow comprehending a clear structure of the bachelor program, particularly the workload on each semester. The experts note that a more detailed overview of the curriculum does shoes a workload of 30 ECTS credit points each semester and a total amount of 240 ECTS credits points of the entire program; however, the presentation is inconsistent with other over-views submitted by KazNU. Therefore, the experts still lack a comprehensive presentation of the study program, which shows the modules and the actual workload of the students in each semester.

Response
We have provided the structure and module of the educational program in additional materials. Perhaps the following table will clearly and understandably show the structure of the educational program “Computational Sciences and Statistics”.

	1 semester	ECTS Credit		2 semester	ECTS Credit		3 semester	ECTS Credit		4 semester	ECTS Credit
1	History of Kazakhstan (State Examination)	5	1	Elective component	5	1	Information and Communication Technologies	5	1	Philosophy	5
2	Foreign Language	5	2	Foreign Language	5	2	Kazakh (Russian) Language	5	2	Kazakh (Russian) Language	5
3	Module of Socio-political Knowledge	8	3	Professional (educational) practice	2	3	Physical Training	2	3	Physical Training	2
4	Physical Training	2		Physical Training	2	4	Numerical Methods-I	5		Professional (Training) Practice	3
5	Mathematical Analysis 1	5	4	Mathematical Analysis 2	5	4	Multivariable Calculus	5	4	Probability Theory	5
6	Linear Algebra and Analytical Geometry	6	6	Discrete Mathematics and Mathematical Logic	5	5	Ordinary Differential Equations	5	6	Fundamentals of functional analysis	3
			7	Algorithms and Data Structures	5	6	Object-oriented Programming	5	7	Partial Differential Equations	5
		31			29			32			28
	5 semester	ECTS Credit		**6 semester**	ECTS Credit		**7 semester**	ECTS Credit		**8 semester**	ECTS Credit
1	Mechanics ///Mathematical models in economics	5	1	Introduction to Data Science ///Time Series Statistics	5	1	Cloud computing	6	1	Professional (Training) Practice	8
2	Fundamentals of stochastic processes///Introduction to Stochastic Analysis	5	2	Introduction to Mathematical Modeling///Stochastic Models and Applications	5	2	Applied tools of Computational Sciences and Statistics	5	2	Professional (pre-diploma) Practice	8
3	Parallelization of Algorithms ///Applied Statistics	5	3	Numerical Methods-III	5	3	Machine Learning	5	3	Final Attestation	8
4	Numerical Methods-II	5	4	Real and complex analysis	6	4	Introduction to Functional Data Analysis	5	4		
5	Introduction to Optimization Theory	5	5	Computational statistics///Statistical analysis	5	5	Fundamentals of Stochastic Financial Mathematics///Nonparametric statistics	5	5		
6	Mathematical Statistics	5	6	Professional (Training) Practice	4	6	Modern methods of computational mathematics///Fundamentals of Statistical Data Science	5	6		
						7	Introduction to Quantum Computing///Markov random processes	5	6		
		30			30			36			24
	Total:										240
	CYCLE OF GENERAL EDUCATION DISCIPLINES										
	CYCLE OF BASIC DISCIPLINES (BD)										
	CYCLE OF BASIC DISCIPLINES Elective component										
	CYCLE OF MAJOR DISCIPLINES (MD)										
	CYCLE OF MAJOR DISCIPLINES Elective component										

2. Comment. The experts acknowledge the presented facts by the experts, but point out that the presentation does not match the module description in the module handbook, which lists the final attestation as “elective.” Since the ASIIN criteria require a mandatory final thesis, the experts point out that the situation needs to be clarified and the module descriptions needs to be adapted to reflect the actual situation in the bachelor study program “Computational Sciences and Statistics.”

Response

Final attestation in all educational programs is a mandatory component and it has never been elective.

3. Comment. The next questions addresses the balance between computational mathematics and statistics in the study program “Computational Sciences and Statistics.” The experts remark that the modules presented in the module handbook are currently only reflect courses on the topic computational sciences and nothing in statistics. The programme coordinators ex-plain that so far all students choose the track on computational sciences. They add that all students start with the same courses in their PhD studies and then choose their electives in the progress of their studies. The experts insists that all courses and specialisation within the program have to be presented if they are chosen by students or not. This includes the lectures on statistics, which need to transparently present to the students in order to acknowledge all choices. Therefore, all potentially offered modules needs to be included in the module handbook even if no student decided to take them. In addition, the module description of modules in the PhD program does not represent the level of a PhD program. Examples therefore are high performance computing, quantum computing, and finite elements. The programme coordinators consider the problem might be a general description, which does not represent the depth of the lectures in the PhD programme.

Response The additional reference of modules includes descriptions of all disciplines, including the disciplines of the trajectory "Computational Statistics"

4. Comment. Within the PhD program “Pure and Applied Mathematics”, the experts also criticize the presentation of the modules in the module handbook. In many cases, the reading lists does not appear to be up-to date with the modern literature whereas the module descriptions require more details to match the level of a PhD programme.

Response

Comment accepted. A random failure occurred while populating the bibliography. In reality, this program uses modern literature in daily work. Lecturers have review articles in their areas. In particular, for the trajectory "Differential operators and mathematical physics", the book https://www.routledge.com/Spectral-Geometry-of-Partial-Differential-Operators/Ruzhansky-Sadybekov-Suragan/p/book/9781138360716 (co- author M. Sadybekov) contains a list of modern literature and is required for study, for the trajectory "Model theory of complete theories" review article http://semr.math.nsc.ru/v17/a1-a58.pdf (co-authors B. Baizhanov, B. Kulpeshov) contains 355 titles of articles only on Model Theory and is obligatory for reading.

5. Comment. Nevertheless, the experts wonder, why the curriculum is much based on “Robotic systems” while the laboratory work by the students was mainly on robotics. This is connected to a discussion on the programme name as described in more detail in criterion 1.2.

Response

We consider the name of the program justified, as it fully corresponds to the terminology used in modern engineering and involves the training of doctoral students with competencies in the field of robotic systems. Research work of doctoral students and laboratory works on the disciplines that are performed in the laboratories of the research institute and the university are devoted to the dynamics, strength and reliability of machines, robots and robotic systems; vibrations in mechanical and robotic systems; machine learning and design of robotic systems; intelligent robotic systems; mechanics of robots and robotic systems; automated design of machines, robots and robotic systems; control of robots and robotic systems and others.

In the laboratory of the institute, doctoral students can gain practical skills, test scientific developments, but the educational program itself is structured in such a way that the main scientific direction is robotic systems

6. Comment. The experts are further unclear on the publication requirements for the PhD students in order to graduate. In the module handbook, the descriptions mentions that seven publications are mandatory. During the different discussion rounds on the on-site visits, the expert panels receives different explanations and numbers of required publications before an document is handed to the experts clearly stating four different methods to publish. This documents explain the publication requirements in more details and shows four different schemes for publications depending on the level of the journals. For example, if students publish one scientific article in a journals listed as Q1, it is sufficient to graduate; if they publish their work on a scientific journal listed as Q2, two publications are required for graduation.

Response

The module handbook lists only the total number of publications without their ranking. Detailed requirements are already being issued by the Department of Science and Innovation of KazNU, depending on changes in the legislation on postgraduate education.

4. Transparency and documentation

Criterion 4.1 Module descriptions

Comment. Furthermore, the information presented in the module handbooks needs to be consistent among all presentations of the study programs on various platforms and in all

documents. In addition, the module handbooks needs to be publicly available for all stakeholders; the experts suggest therefore publishing the module handbooks on the webpage of the university/faculty. To increase the transparency of the study programmes, the experts suggest adding a clear study plan for all students, including information on all possible study tracks/specializations. This information should be comprehensively presented on the webpage for everyone interested in the study programmes.

Response

All programs have an up-to-date description in the public domain on the university website at the address for doctoral studies https://welcome.kaznu.kz/en/education_programs/doctorate/speciality

and for undergraduate studies https://welcome.kaznu.kz/en/education_programs/bachelor/

We also post information on the website of the faculty for undergraduate studies https://www.kaznu.kz/en/25227/page/

and for doctoral studies https://www.kaznu.kz/en/25290/page/

Criterion 4.3 Relevant rules

Comment. In particular, important topics are not specified in the contract. This includes the question on who is responsible for the structure, content, quality management and graduation in each of the three doctoral programmes, especially in the programme "Pure and applied mathematics" which is entire taught by external lectures. A clear and comprehensive paragraph or provision should be included in this contract. The contracts needs to name the responsible party on these issues to guarantee the quality of education. Further, the contract should contain a provision on what happens if the standard of education is not adequate e.g. if the teaching in one module or the supervision of a doctoral thesis falls below a desired standard. Similarly, a provision should name the responsible party for continued development of the programs and updates in the curricula of these programmes.

Response

The university and research institutes of the Committee of Science of the Ministry of Education and Science of Kazakhstan signed a general agreement. The purpose of which is to create the necessary conditions for the implementation of scientific projects and joint educational programs of higher and postgraduate education. We have placed the translation of this agreement into English in the "Answers for point 8" folder. Under this agreement, the

faculty can cooperate with a number of research institutes on various educational programs. For accredited programs, we cooperate with the Institute of Mechanics and Engineering Science named after academician U.A. Dzholdasbekov, with the Institute of Mathematics and Mathematical Modeling of the CS MES RK.

The educational programme "Pure and Applied Mathematics" is implemented based on the Al-Farabi Kazakh National University. The Institute of Mathematical and Computer Modeling (hereinafter referred to as the Institute) is a scientific organization and does not independently carry out educational activities, as it does not have a license for educational operations. In this regard, also in order to foster the integration of science and education, Al-Farabi Kazakh National University has signed a General Agreement with the Institute of Mathematical and Computer Modeling.

The purpose of the General Agreement is the joint implementation of a group of educational programmes at the bachelor, master, doctoral levels, including: B055 "Mathematics and Statistics", M092 "Mathematics and Statistics", D092 "Mathematics and Statistics". The group of educational programs "Mathematics and Statistics" includes three educational programmes for all three levels (B, M, D): "Mathematics", "Computational Sciences and Statistics" and "Pure and Applied Mathematics". We have previously sent a translation of this agreement into English. In Appendix of the General Agreement you will find the titles of the group of educational programmes, where you will see the group of educational programmes "Mathematics and Statistics". Also, within the framework of the General Agreement, on the basis of the Institute, students, in particular master's and PhD students of the university, carry out scientific research and undergo the industrial practice. In addition, professors from the Institute conduct classes for master's and PhD students at KazNU, on the educational programme "Pure and Applied Mathematics".

In addition, professors of the Institute conduct classes for doctoral students of KazNU on the educational program "Pure and Applied Mathematics". It should be noted that this program belongs to KazNU and consists of KazNU students, the institute's researchers are hired as part-time professors. Responsibility for the content of the courses of the Program lies with the research staff of the institute, who are professors of KazNU, and the acceptance of the course content is usual and traditional for KazNU.”

G Summary: Expert recommendations (05.06.2023)

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Pure and Applied Mathematics	With requirements for one year	30.09.2028
PhD Robotic Systems	With requirements for one year	30.09.2028

Requirements

For all degree programmes

A 1. (ASIIN 1.2) Ensure that the name of the degree programme, its intended learning outcomes and its content correspond with each other.

A 2. (ASIIN 1.2) The English programme titles need to be consistent across all relevant platforms and documents.

A 3. (ASIIN 1.3) The curricular overview of each study programme needs to be revised in order to clearly show the structure as well as the correct workload. The workload needs to be consistent in each presentation on all relevant platforms and documents, including the actual amount of ECTS credit points of each module and the entire study programme.

A 4. (ASIIN 1.3) The module handbook needs to contain consistently used English titles and descriptions with respect to the specific terminology. The module prerequisites and postrequisites need to be consistent and all other information needs to be complete including the names of instructors. Further, the selection of the language of instructions needs to be clearly stated.

A 5. (ASIIN 1.5 and 4.1) The module descriptions need to include information about the students' total workload considering hours divided in classroom, assignments and self-study.

A 6. (ASIIN 2) It needs to be ensured that the form of examination aligns with the intended learning outcomes of the respective module as well as the scientific level of the study programme.

A 7. (ASIIN 4.1) The university needs to include a comprehensive presentation of the course of the studies in each programme on their webpage. This presentation needs to make all possible tracks/specialisations within the study programme and the study language visible for all stakeholders. In addition, the full, detailed module handbooks need to be publicly accessible.

A 8. (ASIIN 5) Teachers need to discuss the results of the questionnaires with their students and inform them on feasibility of improvements in order to close the feedback cycles.

For all PhD programmes

A 9. (ASIIN 1.4) The admission requirements for the PhD programmes needs to be clearly defined and transparently presented to all stakeholders. This includes the required technical qualification from the preceding qualifications from the master studies as well as options to supplement missing prerequisites.

A 10. (ASIIN 4.3) The university needs to transparently present the structure of the PhD programmes including admission (requirements), course of study with different tracks/specialisations, graduation requirements and students' professional orientation regarding possible areas of occupation after graduation. The presented information needs to be consistent in all platforms and documents.

A 11. (ASIIN 4.3) The contract between the Al-Farabi University and the National Academy of Sciences of the Republic of Kazakhstan needs to early identify the responsible party for the structure, content, quality assurance and awarding degrees to ensure the quality of education within the degree programmes.

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended, to clearly define the scientific level of the bachelor and doctoral programmes and match the content of the modules accordingly.

E 2. (ASIIN 3.1) It is recommended to improve the English competence level of the teaching staff, in particular those staff members involved in the PhD programmes.

E 3. (ASIIN 3.1) It is recommended to reduce the teaching load for the members of the faculty; possible mechanisms include among others sharing modules between different programmes or enforcing minimum student number for an elective module.

E 4. (ASIIN 3.1) It is recommended to improve the internal communication between programme coordinators, teaching staff, other university institutions, and the Center for Training of Scientific Personnel "Gylym Ordasy". In particular, this refers to committees and boards that are relevant to the programme, such as examination committee, if there exists such a committee.

E 5. (ASIIN 5) It is recommended to create an independent board (body) inside the university to address in case of serious complaints.

Recommendations for the Ba “Computational Sciences and Statistics”

E 6. (ASIIN 1.3) It is recommended to improve the curriculum and include important missing topics in the computational field; these include theoretical foundations of computing, multi-dimensional calculus, mathematical modelling, complexity of algorithms (in contrast to the complexity theory in mathematics), formal languages, and automata theory.

E 7. (ASIIN 1.3) Revise the small size of the modules (3 ECTS credit points and below) in order to regroup the learning content into larger units to avoid a fragmentation of the content.

Recommendations for PhD programme “Robotic systems”

E 8. (ASIIN 1.3) It is recommended to stronger implement robotics operating systems in the curriculum

H Comment of the Technical Committees

Technical Committee 04 – Informatics/Computer Science (15.06.2023)

Assessment and analysis for the award of the ASIIN seal:

The TC discusses the procedure. The TC mainly discusses recommendations E 1 and E 6. The TC is not sure whether the focus of E 1 is on the word "clearly" or whether the scientific level is generally insufficiently defined. If the latter applies, the FA sees this as a clear deficiency that should lead to a requirement. Therefore, the TC is in favour of converting E 1 into a requirement (A 12). Regarding recommendation E 6, the TC is of the opinion that it should be ensured that this missing content will actually be integrated into the curriculum. For this reason, the TC is in favour of also converting recommendation E 6 into a requirement (A 13). However, the specific topics mentioned in the recommendation should only serve as examples, which is why an e.g. is introduced. In addition, the TC pro-poses editorial changes to requirement A4 and requirement A8.

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

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Robotic Systems	With requirements for one year	30.09.2028

Requirements

For all degree programmes

A 1. (ASIIN 1.2) Ensure that the name of the degree programme, its intended learning outcomes and its content correspond with each other.

A 2. (ASIIN 1.2) The English programme titles need to be consistent across all relevant platforms and documents.

A 3. (ASIIN 1.3) The curricular overview of each study programme needs to be revised in order to clearly show the structure as well as the correct workload. The workload needs to be consistent in each presentation on all relevant platforms and documents, including the actual amount of ECTS credit points of each module and the entire study programme.

A 4. (ASIIN 1.3) The module handbook needs to contain consistently used English titles and descriptions with respect to the specific terminology. The module prerequisites and learning outcomes need to be consistent and all other information needs to be complete including the names of instructors. Further, the selection of the language of instructions needs to be clearly stated.

A 5. (ASIIN 1.5 and 4.1) The module descriptions need to include information about the students' total workload considering hours divided in classroom, assignments and self-study.

A 6. (ASIIN 2) It needs to be ensured that the form of examination aligns with the intended learning outcomes of the respective module as well as the scientific level of the study programme.

A 7. (ASIIN 4.1) The university needs to include a comprehensive presentation of the course of the studies in each programme on their webpage. This presentation needs to make all possible tracks/specialisations within the study programme and the study language visible for all stakeholders. In addition, the full, detailed module handbooks need to be publicly accessible.

A 8. (ASIIN 5) Lecturers need to discuss the results of the questionnaires with their students and inform them on feasibility of improvements in order to close the feedback cycles.

For all PhD programmes

A 9. (ASIIN 1.4) The admission requirements for the PhD programmes needs to be clearly defined and transparently presented to all stakeholders. This includes the required technical qualification from the preceding qualifications from the master studies as well as options to supplement missing prerequisites.

A 10. (ASIIN 4.3) The university needs to transparently present the structure of the PhD programmes including admission (requirements), course of study with different tracks/specialisations, graduation requirements and students' professional orientation regarding possible areas of occupation after graduation. The presented information needs to be consistent in all platforms and documents.

A 11. (ASIIN 4.3) The contract between the Al-Farabi University and the National Academy of Sciences of the Republic of Kazakhstan needs to early identify the responsible party for the structure, content, quality assurance and awarding degrees to ensure the quality of education within the degree programmes.

A 12. (ASIIN 1.3) Clearly define the scientific level of the bachelor and doctoral programmes and match the content of the modules accordingly.

Requirements for the Ba "Computational Sciences and Statistics"

A 13. (ASIIN 1.3) Improve the curriculum and include missing topics in the computational field, specifically in theoretical computer science, e.g. theoretical foundations of computing, multi-dimensional calculus, mathematical modelling, complexity of algorithms (in contrast to the complexity theory in mathematics), formal languages, and automata theory.

Recommendations

For all degree programmes

E 1. (ASIIN 3.1) It is recommended to improve the English competence level of the teaching staff, in particular those staff members involved in the PhD programmes.

E 2. (ASIIN 3.1) It is recommended to reduce the teaching load for the members of the faculty; possible mechanisms include among others sharing modules between different programmes or enforcing minimum student number for an elective module.

E 3. (ASIIN 3.1) It is recommended to improve the internal communication between programme coordinators, teaching staff, other university institutions, and the Center for Training of Scientific Personnel "Gylym Ordasy". In particular, this refers to committees and boards that are relevant to the programme, such as examination committee, if there exists such a committee.

E 4. (ASIIN 5) It is recommended to create an independent board (body) inside the university to address in case of serious complaints.

Recommendations for the Ba "Computational Sciences and Statistics"

E 5. (ASIIN 1.3) Revise the small size of the modules (3 ECTS credit points and below) in order to regroup the learning content into larger units to avoid a fragmentation of the content.

Recommendations for PhD programme "Robotic systems"

E 6. (ASIIN 1.3) It is recommended to stronger implement robotics operating systems in the curriculum

Technical Committee 12 – Mathematics (09.06.2023)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee questions if a continuation of this accreditation procedure is feasible considering the large number of requirements and recommendations. However, the expert panel has previously considered the nature and severity of the requirements and recommendation and voted to proceed with the accreditation with requirements rather than a suspension. Therefore, the Technical Committee agrees with all requirements and recommendations of the expert panel, but does not make a decision on the requirement A11. In the opinion of the Technical Committee, the decision on A11 lies with the accreditation committee.

The Technical Committee 12 – Mathematics recommends the award of the seals as follows:

Degree Programme	ASIIN Seal	Maximum duration of accreditation
Ba Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Pure and Applied Mathematics	With requirements for one year	30.09.2028

Requirements

For all degree programmes

A 1. (ASIIN 1.2) Ensure that the name of the degree programme, its intended learning outcomes and its content correspond with each other.

A 2. (ASIIN 1.2) The use of the English programme title as need to be consistent across all relevant platforms and documents.

A 3. (ASIIN 1.3) A curricular overview of each study programmes needs to be revised in order to clearly show the structure as well as the correct workload. The workload

needs to be consistent in each presentation on all relevant platforms and documents, including the actual amount of ECTS credit points of each module and the entire study programme.

A 4. (ASIIN 1.3) The module handbook needs to contain consistently used English titles and descriptions with respect to the specific terminology. The module prerequisites and postrequisites need to be consistent and all other information needs to be complete including the names of instructors. Further, the selection of the language of instructions needs to be clearly stated.

A 5. (ASIIN 1.5 and 4.1) The module descriptions need to include information about the students' total workload considering hours divided in classroom, assignments and self-study.

A 6. (ASIIN 2) It needs to be ensured that the form of examination aligns with the intended learning outcomes of the respective module as well as the scientific level of the study programme.

A 7. (ASIIN 4.1) The university needs to include a comprehensive presentation of the course of the studies in each programme on their webpage. This presentation needs to make all possible tracks/specialisations within the study programme and the study language visible for all stakeholders. In addition, the full, detailed module handbooks needs to be publicly accessible.

A 8. (ASIIN 5) Teachers need to discuss the results of the questionnaires with their students and inform them on feasibility of improvements in order to close the feedback cycles.

For all PhD programmes

A 9. (ASIIN 1.4) The admission requirements for the PhD programmes needs to be clearly defined and transparently presented to all stakeholders. This includes the required technical qualification from the preceding qualifications from the master studies as well as options to supplement missing prerequisites.

A 10. (ASIIN 4.3) The university needs to transparently present the structure of the PhD programmes including admission (requirements), course of study with different tracks/specialisations, graduation requirements and students' professional orientation regarding possible areas of occupation after graduation. The presented information needs to be consistent in all platforms and documents.

A 11. [(ASIIN 4.3) The contract between the Al-Farabi University and the National Academy of Sciences of the Republic of Kazakhstan needs to early identify the responsible party for the structure, content, quality assurance and awarding degrees to ensure the quality of education within the degree programmes].

Recommendations

For all degree programmes

E 1. (ASIIN 1.3) It is recommended, to clearly define the scientific level of the bachelor and doctoral programmes and match the content of the modules accordingly.

E 2. (ASIIN 3.1) It is recommended to improve the English competence level of the teaching staff; in particular, those staff members involved in the PhD programmes.

E 3. (ASIIN 3.1) It is recommended to reduce the teaching load for the members of the faculty; possible mechanisms include among others sharing modules between different programmes or enforcing minimum student number for an elective module.

E 4. (ASIIN 3.1) It is recommended to improve the internal communication between programme coordinators, teaching staff, other university institutions, and the Center for Training of Scientific Personnel "Gylym Ordasy". In particular, this refers to committees and boards that are relevant to the programme, such as examination committee, if there exists such a committee.

E 5. (ASIIN 5) It is recommended to create an independent board (body) inside the university to address in case of serious complaints.

Recommendations for the Ba “Computational Sciences and Statistics”

E 6. (ASIIN 1.3) It is recommended to improve the curriculum and include important missing topics in the computational field; these include theoretical foundations of computing, multi-dimensional calculus, mathematical modelling, complexity of algorithms (in contrast to the complexity theory in mathematics), formal languages, and automata theory.

E 7. (ASIIN 1.3) Revise the small size of the modules (3 ECTS credit points and below) in order to regroup the learning content into larger units to avoid a fragmentation of the content.

I Decision of the Accreditation Commission (23.06.2023)

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

The accreditation commission discussed this procedure. It follows the suggestions of the Technical Committee 04 – Informatics/Computer Science to change two recommendations to the new requirements A8 and A13. Further, the accreditation commission refers to use "Teaching staff" instead of "Teachers" in requirement A9 to ensure the entire staff members are integrated. In addition, the accreditation commission changes the working of the requirement A12 in order to clarify the aim of the requirement.

The Accreditation Commission decides to award the following seals:

Degree Programme	**ASIIN Seal**	**Maximum duration of accreditation**
Ba Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Computational Sciences and Statistics	With requirements for one year	30.09.2028
PhD Pure and Applied Mathematics	With requirements for one year	30.09.2028
PhD Robotic Systems	With requirements for one year	30.09.2028

Requirements

For all degree programmes

A 1. (ASIIN 1.2) Ensure that the name of the degree programme, its intended learning outcomes and its content correspond with each other.

A 2. (ASIIN 1.2) The use of the English programme title as need to be consistent across all relevant platforms and documents.

A 3. (ASIIN 1.3) A curricular overview of each study programmes needs to be revised in order to clearly show the structure as well as the correct workload. The workload

needs to be consistent in each presentation on all relevant platforms and documents, including the actual amount of ECTS credit points of each module and the entire study programme.

A 4. (ASIIN 1.3) The module handbook needs to contain consistently used English titles and descriptions with respect to the specific terminology. The module prerequisites and postrequisites need to be consistent and all other information needs to be complete including the names of instructors. Further, the selection of the language of instructions needs to be clearly stated.

A 5. (ASIIN 1.5 and 4.1) The module descriptions need to include information about the students' total workload considering hours divided in classroom, assignments and self-study.

A 6. (ASIIN 2) It needs to be ensured that the form of examination aligns with the intended learning outcomes of the respective module as well as the scientific level of the study programme.

A 7. (ASIIN 4.1) The university needs to include a comprehensive presentation of the course of the studies in each programme on their webpage. This presentation needs to make all possible tracks/specialisations within the study programme and the study language visible for all stakeholders. In addition, the full, detailed module handbooks needs to be publicly accessible.

A 8. (ASIIN 4.1 and 1.3) Clearly define the scientific level of the bachelor and doctoral programmes in the module descriptions and match the content of the modules accordingly.

A 9. (ASIIN 5) Teaching staff need to discuss the results of the questionnaires with their students and inform them on feasibility of improvements in order to close the feedback cycles.

For all PhD programmes

A 10. (ASIIN 1.4) The admission requirements for the PhD programmes needs to be clearly defined and transparently presented to all stakeholders. This includes the required technical qualification from the preceding qualifications from the master studies as well as options to supplement missing prerequisites.

A 11. (ASIIN 4.3) The university needs to transparently present the structure of the PhD programmes including admission (requirements), course of study with different tracks/specialisations, graduation requirements and students' professional orientation regarding possible areas of occupation after graduation. The presented information needs to be consistent in all platforms and documents.

A 12. (ASIIN 4.3) The contract between the Al-Farabi University and the National Academy of Sciences of the Republic of Kazakhstan needs to clearly identify Al-Farabi University as the responsible party for the final decision on the structure, content, quality assurance, awarding degrees and ensuring the quality of education within the degree programmes.

Requirements for the Ba "Computational Sciences and Statistics"

A 13. (ASIIN 1.3) Improve the curriculum and include missing topics in the computational field, specifically in theoretical computer science, e.g. theoretical foundations of computing, multi-dimensional calculus, mathematical modelling, complexity of algorithms (in contrast to the complexity theory in mathematics), formal languages, and automata theory.

Recommendations

For all degree programmes

E 1. (ASIIN 3.1) It is recommended to improve the English competence level of the teaching staff, in particular those staff members involved in the PhD programmes.

E 2. (ASIIN 3.1) It is recommended to reduce the teaching load for the members of the faculty; possible mechanisms include among others sharing modules between different programmes or enforcing minimum student number for an elective module.

E 3. (ASIIN 3.1) It is recommended to improve the internal communication between programme coordinators, teaching staff, other university institutions, and the Center for Training of Scientific Personnel "Gylym Ordasy". In particular, this refers to committees and boards that are relevant to the programme, such as examination committee, if there exists such a committee.

E 4. (ASIIN 5) It is recommended to create an independent board (body) inside the university to address in case of serious complaints.

Recommendations for the Ba "Computational Sciences and Statistics"

E 5. (ASIIN 1.3) Revise the small size of the modules (3 ECTS credit points and below) in order to regroup the learning content into larger units to avoid a fragmentation of the content.

Recommendations for PhD programme "Robotic systems"

E 6. (ASIIN 1.3) It is recommended to stronger implement robotics operating systems in the curriculum

Appendix: Programme Learning Outcomes and Curricula

According to self-assessment report, the following **learning outcomes (intended qualifications profile)** shall be achieved by the bachelor degree programme "Computational Sciences and Statistics":

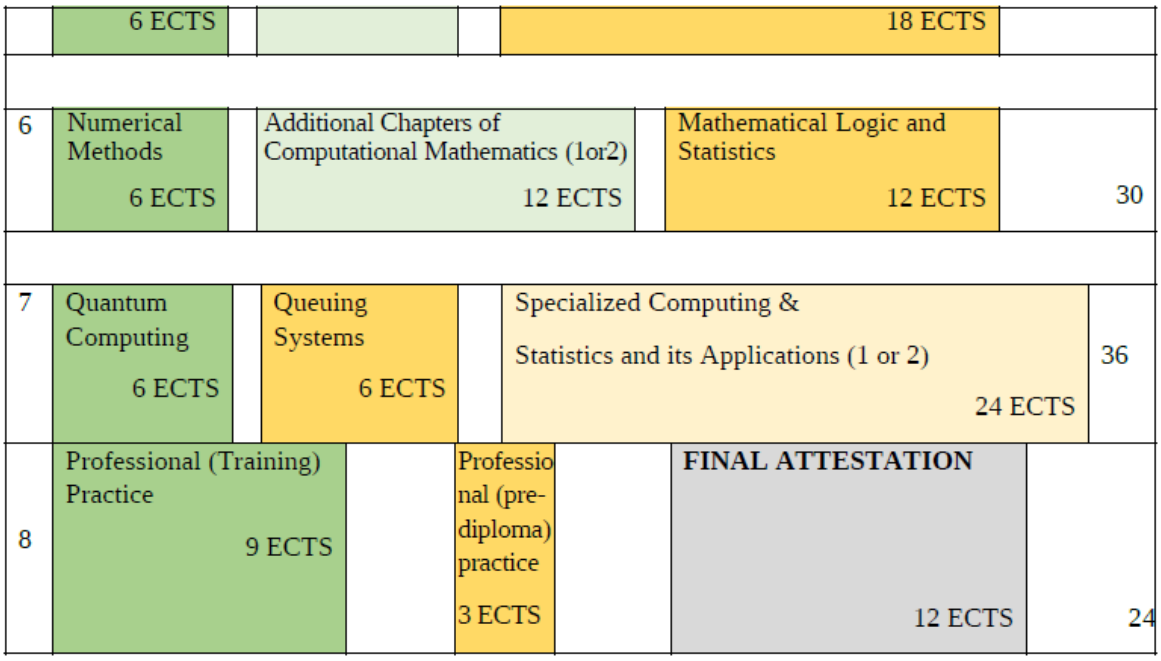
PLO1	Demonstrate mathematical literacy, logical thinking and knowledge of the basic concepts and ideas of mathematics methods, master the mathematical language in the subject area.
PLO2	Choose modern methods of computational science and statistics and apply them in solving problems of natural science.
PLO3	Be able to formulate and test statistical hypotheses that correspond to the data of the studied problem.
PLO3	Master the methods of computational mathematics and statistics as the main tools for solving complex mathematical models and problems at the present time.
PLO5	Analyze the results of computational work and visualize the processes described by mathematical models based on them.
PLO6	Use programming tools and develop new programs for implementing methods of computational mathematics and statistics.
PLO7	Summarize the results of research and computational work in the relevant fields of science in the form of participation in research projects and presentations at conferences.
PLO8	Create computer models of real processes based on computational and statistical data.
PLO9	Create mathematical models of the object under study based on the principles and tools of mathematical methods.
PLO10	Use methods for quantifying statistical data of different nature.

PLO11	Create applications to software packages for optimizing professional activity in the studied fields of science, conduct laboratory and numerical experiments, and evaluate the accuracy and reliability of simulation results.
PLO12	Work in a team, argue for the correct choice of solutions to mathematical and statistical problems; critically evaluate their activities, the activities of the team, and be able to self-education and self-development.

The following **curriculum** is presented:

GENERAL EDUCATION DISCIPLINES		CORE DISCIPLINES		MAJOR DISCIPLINES	
OBLIGATORY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
51	5	94	18	36	24
56		**112**		**60**	

TERM				
1	Social and Cultural Development Module & Instrumental Module & Module Physical Training 25 ECTS		Mathematical Foundations 9 ECTS	34
2	Instrumental Module & Physical Education Module 12 ECTS	Elective component (1 of 6) 5 ECTS	Mathematical Foundations 6 ECTS	23
3	Instrumental Module & Physical Education Module 7 ECTS	Probability Theory and Statistics & Differential Equations and Computational Mathematics & Basics of Programming 24 ECTS		31
4	Social and Cultural Development Module & Physical Education Module 7 ECTS	Probability Theory and Statistics & Differential Equations and Computational Mathematics & Basics of Programming 24 ECTS		29
5	Numerical Methods	Additional Chapters of Computational Mathematics 6 ECTS	Mathematical Logic and Statistics	30



According to self-assessment report, the following **learning outcomes (intended qualifications profile)** shall be achieved by the doctoral degree programme "Computational Sciences and Statistics":

PLO1	Conduct scientific research and obtain new fundamental and applied results, critically analyse and evaluate the results obtained, formulate well-grounded conclusions even in conditions of incomplete or limited information.
PLO2	Write scientific articles in foreign and domestic scientific journals and inform the wide scientific community of advanced topics and research results at international and national conferences, seminars and workshops, critically assessing their significance.
PLO3	Write independently scientific projects and applications, setting a theoretical or practical computational problem or a solution method that is relevant for society, implement and correct, if necessary, the process of independent scientific research.
PLO4	Determine the direction and intensity of their professional development in the chosen scientific field, be able to work in a team and contribute to the development of the team and society as a whole.

PLO5	Conduct scientific research in the field of methodology of computational experiments based on the approximation of differential equations by the methods of finite differences, volumes and / or elements.
PLO6	Conduct a fundamental analysis of computational methods and difference schemes for convergence and correctness, including in the case of high-performance algorithms.
PLO7	Create and use correct structured, curvilinear, unstructured computational grids in computational tasks.
PLO8	Develop parallel computing algorithms for engineering problems and implement them in high-performance systems, develop quantum computing algorithms.
PLO9	Use methods of mathematical statistics based on real data for the selection of parameters, adaptation and testing of computing systems based on real experiments.
PLO10	Use deep learning, reinforcement learning, data mining techniques to adapt the computational algorithm to effectively predict outcomes.

The following **curriculum** is presented:

General diagram encompassing all disciplines in the educational program «Computational Sciences and Statistics» 8D05405

1 semester	Credits	2 semester	Credits	3 semester	Credits	4 semester	Credits	5 semester	Credits	6 semester	Credits	Total credits
M-1 Academic writing(in English)	2	Teaching Internship	10	Research Practice	5	Research Practice	5	Scientific Internship	10	PhD Thesis Writing and Defence	12	
The implementation of a Doctoral Thesis	3	The implementation of a Doctoral Thesis	11	The implementation of a Doctoral Thesis	14	The implementation of a Doctoral Thesis	15	The implementation of a Doctoral Thesis	8	The implementation of a Doctoral Thesis	2	
Research Seminar	3	Research Seminar	2	Research Seminar	8	Research Seminar	4	Research Seminar	3	Research Seminar	1	
		Graduate Seminar	6			Graduate Seminar	6	Graduate Seminar	6			
M-1 Scientific Research Methods	3			Participation in International Scientific Conferences	3			Participation in International Scientific Conferences	3	Publication of the Main Scientific Results of the Dissertation in Scientific Results of the Dissertation in Scientific Journals	15	
M-2 Curvilinear adaptive meshes	5											
M-2 Advanced Statistics	5											
M-1 Quantum Computing \\ Big Data & High Performance Statistical Computing	5											
M-2 Finite element method \\ Intelligent systems for monitoring and forecasting processes	5											
Total credits	31	Total credits	29	Total credits	30	Total credits	30	Total credits	30	Total credits	30	180

COLOR INTERPRETATION (in table)

RESEARCH			CORE DISCIPLINES		MAJOR DISCIPLINES	
UNIVERSITY COMPONENT	SEMINAR	DOCTORAL THESIS	UNIVERSITY COMPONENT	ELECTIVE COMPONENT	UNIVERSITY COMPONENT	ELECTIVE COMPONENT
31	39	53	15	5	20	5
123			20		25	

FINAL ATTESTATION
12 ECTS

According to self-assessment report, the following **learning outcomes (intended qualifications profile)** shall be achieved by the doctoral degree programme “Pure and Applied Mathematics:

PLO1	To use innovative pedagogical technologies, methods for teaching mathematical disciplines; develop assessment tools, guidelines, methodological manuals.
PLO2	On the basis of deep system knowledge in the field of model theory, algebra, differential equations, mathematical physics, create forecasting techniques, modelling complex systems.
PLO3	Formulate tasks and hypotheses that create interest in the global scientific community.
PLO4	Conduct research work, solve problems, prove theorems, creating competition to the advanced scientific community.

PLO5	Lead (or be in the forefront) of a scientific school in the direction of Algebra. Actively working with leading foreign scientists in this direction.
PLO6	Lead (or be in the forefront) scientific school in the direction of mathematical logic. Actively working with leading foreign scientists in this direction.
PLO7	Lead (or be in the forefront) scientific school in the direction of Differential Equations. Actively working with leading foreign scientists in this direction.
PLO8	Lead (or be in the forefront) scientific school in the direction of Mathematical Physics. Actively working with leading foreign scientists in this direction.
PLO9	Organize and manage scientific conferences. Management of scientific seminars.
PLO10	To conduct expert opinions on scientific works in the following directions: theory of models, algebra, differential equations, mathematical physics. And also to do a review on the work of undergraduates, doctoral candidates, theses and scientific articles.
PLO11	Advise commercial organizations on mathematical modeling of processes and forecasting their behavior.
PLO12	To own and use linguistic and linguistic knowledge for communication and publications in multilingual and multicultural society in the international arena.

The following **curriculum** is presented:

Course structure

RESEARCH			CORE DISCIPLINES		MAJOR DISCIPLINES	
UNIV. COMP.	RESEARCH SEMINAR	DOC-TORAL THESIS	UNIVER-SITY COM-PONENT	ELECTIVE COMPO-NENT	UNIVERSITY COMPONENT	ELECTIVE COMPO-NENT
49	21	53	15	5	20	5
123			20		25	

TERM

1	Scientific-Research tools 5 ECTS	Elective compo-nent **(1 of 3)** 5 ECTS	Main problems of differential equa-tions, geometry and mathematical logic, algebraic questions of differential opera-tors 10 ECTS	Res. of act. problems **(1 of 3)** 5 ECTS	Res. Sem. 3 ECTS	Doc. Thes. 2 ECTS	30

2	Professional module practice 10 ECTS	RS 2	Doctoral Thesis 12 ECTS	Graduate Seminar 6 ECTS	30

3	Profes-sional practice module 5 ECTS	Research Semi-nar 8 ECTS	Doctoral Thesis 14 ECTS	Sci. Conf. 3 ECTS	30

4	Profes-sional practice 5 ECTS	Re-search Semi-nar 4 ECTS	Doctoral Thesis 15 ECTS	Graduate Seminar 6 ECTS	30

5	Res. Sem. 3 ECTS	Doctoral Thesis 14 ECT		Graduate Seminar Scientific conferences (Participation) Scientific Internship 13 ECTS	30
6	RS 1	DT 2	15 ECTS	FINAL ATTESTATION 12 ECTS	30

According to self-assessment report, the following **learning outcomes (intended qualifications profile)** shall be achieved by the doctoral degree programme "Robotic Systems":

PLO1	Scientifically justified to analyse and evaluate modern scientific achievements in the field of robotics to generate new ideas in solving research and practical problems, formulating and solving atypical problems of a design character in the design, manufacture and operation of new robotic systems and scientific guidance on research on the scientific problems of fundamental robotics and applied character.
PLO2	Apply modern research, modelling and design methods to create new classes of mechatronic and robotic systems, including intelligent robotic systems and mobile robots.
PLO3	To develop methods for research and modelling of mechatronic and robotic systems for various purposes, including those with elements of artificial intelligence and technical vision; to develop and research promising algorithms and methods for controlling mechatronic and robotic systems.
PLO4	Conduct a research examination of completed research and experimental de-

	velopment to summarize the results of research, plan and conduct experimental research, followed by an adequate assessment of the results; apply the results of research activities in the creation and research of promising robotic and mechatronic systems, new models of manipulation, mobile, humanoid and parallel robots; introduction of research and development into production.
PLO5	Professionally present the results of their research and present them in the form of scientific publications, information and analytical materials and presentations for the objective assessment of the professional level of scientific research results, including using international databases of publication activity; to present the results in the professional community and publish research results in academic journals.
PLO6	Use modern methods and technologies of scientific communication in the state and foreign languages for professional interaction with colleagues and foreign partners in order to improve the practice of education and science, participate in the work of domestic and international research teams and in scientific discussions in the academic and professional environment by the decision of scientific and scientific educational tasks, conducting joint research in the field of robotics and attracting additional funding.
PLO7	Participate in the implementation of the educational process of the educational organization using innovative educational technologies and teaching methods to form the professional competencies of students and researchers, determine the course content and form educational and methodological support for the educational process as part of the Robotic systems educational program.
PLO8	Follow ethical standards in professional work, own a culture of scientific research, including using the latest information and communication technologies, plan and solve problems of their own professional and personal development, introduce students to the system of social values and tolerant interaction in society to form professionally significant qualities of students.

The following **curriculum** is presented:

Course structure 8D07117- Robotic systems

RESEARCH			CORE DISCIPLINES		MAJOR DISCIPLINES	
UNIV. COMP.	RESEARCH SEMINAR	DOC-TORAL THESIS	UNIVER-SITY COM-PONENT	ELECTIVE COMPO-NENT	UNIVERSITY COMPONENT	ELECTIVE COMPO-NENT
49	21	53	15	5	15	10
123			20		25	

TERM

1	Scientific-Research tools 5 ECTS	Elective compo-nent **(1 of 2)** 5 ECTS	Technical vision 5 ECTS	Parallel Robot Des-ing (Al-Farabi KazNU)/Robotics and CAD (Science research Institute), Humanoid robot desing (Al-Farabi KazNU)/ Mecha-tronics and Dynam-ics of Mobile Ro-bots (Science re-search Institute) **(1 of 2)** 10 ECTS	Res. Sem. 3 ECTS	Doc. Thes. 2 ECTS	30
2	Professional practice module 10 ECTS	RS 8	Doctoral Thesis 12 ECTS				30

3	Profes-sional practice module 5 ECTS	Research Semi-nar 8 ECTS	Doctoral Thesis 14 ECTS	Sci. Conf. 3 ECTS	30
4	Profes-sional practice 5 ECTS	Re-search Semi-nar 10 ECTS	Doctoral Thesis 15 ECTS		30
5	Res. Sem. 3 ECTS	Doctoral Thesis 14 ECTS	Graduate Seminar Scientific con-ferences (Par-ticipation) Scientific In-ternship 3 ECTS	Scientific Intern-ship 10 ECTS	30
6	RS 1	DT 2	15 ECTS Publication	FINAL ATTESTATION 12 ECTS	30