ASIIN Seal

Accreditation Report

Bachelor's Degree Programmes
Mathematics
Physics
Physics Pedagogic

Master's Degree Programmes
Mathematics
Physics
Physics Pedagogic

Provided by
Al-Farabi Kazakh National University

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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	Previous accreditation (issuing agency, validity)	Involved Technical Committees (TC)[1]
5B060100 Математика (каз, рус)	Bachelor's degree of Mathematics	ASIIN	ASIIN 2010-2015	TC 12
6M060100 Математика (каз, рус)	Master's degree of Mathematics	ASIIN	ASIIN 2010-2015	TC 12
5B060400 Физика (каз, рус)	Bachelor's degree of Physics	ASIIN	ASIIN 2010-2015	TC 13
6M060400 Физика (каз, рус)	Master's degree of Physics	ASIIN	ASIIN 2010-2015	TC 13
5B011000 Физика (Научно педагогоическое направление (рус)) (Ғылыми - педагогикалық бағыт (каз))	Bachelor's degree of Physics (pedagogic)	ASIIN	-	TC 13
6M011000 Физика (Научно педагогоическое направление (рус)) (Ғылыми - педагогикалық бағыт (каз))	Master's degree of Physics (pedagogic)	ASIIN	-	TC 13
Date of the contract: 26.01.2016 **Submission of the final version of the self-assessment report:** 17.10.2016 **Date of the onsite visit:** 28.-29.11.2016 **at:** Al-Farabi Kazakh National University, Faculty of Mechanics and Mathematics, Faculty of Physics and Technology				

[1] TC: Technical Committee for the following subject areas:; TC 12 – Mathematics; TC 13 – Physics.

Peer panel: Prof. Dr. Mathias Getzlaff, Heinrich Heine University Düsseldorf Prof. Dr. Klaus Behler, Mittelhessen University of Applied Science Prof. Dr. Werner Kratz, Former University of Ulm Prof. Dr. Norbert Kalus, Beuth University of Applied Sciences Berlin Gaukar Omashove, M. Auezov South Kazakhstan State University Shymkent Artem Fedoskin, Student Peer M. Auezov South Kazakhstan State University Shymkent	
Representative of the ASIIN headquarter: Dr. Martin Foerster	
Responsible decision-making committee: Accreditation Commission for Degree Programmes	
Criteria used: European Standards and Guidelines as of 15.05.2015 ASIIN General Criteria, as of 10.03.2015 Subject-Specific Criteria of Technical Committee 13 – Physics as of 09.12.2011; 12 – Mathematics as of 09.12.2011	

B Characteristics of the Degree Programmes

a) Name	Final degree (original/English translation)	b) Areas of Specialization	c) Corresponding level of the EQF[2]	d) Mode of Study	e) Double/Joint Degree	f) Duration	g) Credit points/unit	h) Intake rhythm & First time of offer
Bachelor's degree of Mathematics	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS	Fall Semester / no information given
Master's degree of Mathematics	M.Sc.	-	7	Full time	-	4 Semester	120 ECTS	Fall Semester / no information given
Bachelor's degree of Physics	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS	Fall Semester / 2004
Master's degree of Physics	M.Sc.	-	7	Full time	-	4 Semester	120 ECTS	Fall Semester / 2010
Bachelor's degree of Physics (pedagogic)	B.Sc.	-	6	Full time	-	8 Semester	240 ECTS	Fall Semester / 2008
Master's degree of Physics (pedagogic)	M.Sc.	-	7	Full time	-	4 Semester	120 ECTS	Fall Semester / no information given

For the Bachelor's degree programme Mathematics the institution has presented the following profile on the website (http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1 accessed 3rd January 2017):

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

"The program focuses on training highly qualified mathematicians with knowledge and competencies demanded, above all, to work in education sphere, as well as the needs of local and foreign higher education institutions, research centers.

- Provide training in mathematics at the highest academic standards in a competitive but stimulating educational environment, attractive to the best students from other countries.
- Provide students systematic knowledge of the basic course of mathematics, based on a solid experimental and theoretical basis, along with the knowledge of the elective areas, based on the latest achievements of science."

For the Master's degree programme Mathematics the institution has presented the following profile in the Self-Assessment Report:

It is the purpose of the programme "to provide students the fundamental knowledge of mathematics to the study of new quantitative relations and spatial forms of the real world in accordance with the requirements of technology and natural science. Specialist areas are mathematical analysis and function theory, mathematical logic and algebra, stochastic analysis and actuarial mathematics, differential equations, optimization and optimal control, equations of mathematical physics."

For the Bachelor's degree programme Physics the institution has presented the following profile on the website (http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#. accessed 3rd January 2017):

"Purpose and learning outcomes:

- Preparation of advanced specialists and researchers in the field of physics;
- Providing highly professional, competitive staff for research organizations, design bureaus and other organizations of science and technology profile;
- Providing highly qualified teaching staff for organizations of higher, vocational and secondary education;

Objectives of the educational program:

- Give a solid knowledge of classical, fundamental laws of physics, including its various parts and areas, problems and principles of theoretical and experimental physics;
- To generate skills in advanced areas of physics to solve applied problems in innovative and research activities, for a variety of interdisciplinary problems in physics;
- Provide them skills on advanced laboratory studies, give them ability to collect, process and interpretation of scientific information, conduct independent research."

For the Master's degree programme Physics the institution has presented the following profile on the website (http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2 accessed 3rd January 2017):

"Purposes of the educational program:

- providing highly professional and competitive staff for research organizations, design bureaus and other organizations of similar profile;
- providing highly qualified teaching staff for the organization system of higher and secondary education;
- providing highly qualified management staff for various organizations of natural-science and technical profile;

Tasks of the educational program:

- form a system skills related to problem solving, and evaluation of the original data, and communication. Ensure mastery of practical skills and techniques of calculations.
- form the ability of students to carry out certain choice of the direction of future professional activity at the end of the training, and successfully found a job in their chosen field.
- give a strong in-depth knowledge of modern physics and be able to carry out a critical analysis of the state of current scientific researches."

For the Bachelor's degree programme Physics (pedagogic) the institution has presented the following profile in the Self-Assessment Report:

"Distinctive features of our program is the Educational program of undergraduate specialty – Physics. It is focused on the training of highly qualified specialists in the field of Physics. Education is given by three tracks which cover the physics fields entirely, that is theoretical (relativity, nuclear physics, plasma physics) and experimental physics (plasma physics, thermal physics). The purpose of the program is to train the highly qualified teachers and specialists in the field of Physics. The task of program is to form the students' abilities and skills, to give them the appropriate knowledge for the professional activity."

For the Master's degree programme Physics (pedagogic) the institution has presented the following profile on the website (http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2 accessed 3rd January 2017):

"The purpose of the educational program:

- Provide training for specialist teachers in physics and plasma physics in accordance with the highest academic standards in a competitive but challenging educational environment, attractive to the best students from the Republic of Kazakhstan and other countries.
- To provide students a systematic knowledge of core courses and plasma physics, information technology and innovative teaching physics, physics discharge and dynamic processes in the plasma, nonlinear phenomena in strongly coupled plasmas, based on a solid experimental and theoretical basis, along with the knowledge of the elective areas based on the latest achievements of science.

Objectives of the educational program:

- Development of system skills related to problem solving, critical assessment of the original data, and communication. Ensure mastery of practical skills and techniques perform calculations.
- By the end of training to form a students' ability to freely navigate in the research and education environment to make a confident choice for future professional activities, to be competitive in their chosen field.
- Graduates should have in-depth knowledge base, to have a general idea of the problems and challenges of modern physics to be able to carry out a critical analysis of the state of current research.

- Graduates must complete a serious instructional and research point of view, the project, which requires in-depth practical and theoretical knowledge and the technique of research using modern computer technologies and methods that provide the original result.
- Graduates should be prepared to learn for a scientific (academic) degree in any leading university of the Republic of Kazakhstan or other countries, or for a professional career related to the conduct of research in the sectors of industry, based on the use of physical knowledge.

C Peer Report for the ASIIN Seal

1. The Degree Programme: Concept, content & implementation

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

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Objectives-module matrix «5B060100 – Mathematics»
- Objectives-module matrix «6M060100 – Mathematics»
- Objectives-module matrix Bachelor Program in Physics 5B060400
- Objectives-module matrix Master degree Program in Physics 6M060400
- Objectives-module matrix Bachelor Program in Physics 5B011000
- Objectives-module matrix Master degree Program in Physics 6M011000
- Diploma Supplements
- Learning outcomes descriptions on the websites for Bachelor Mathematics and Physics and Master Physics and Physics (pedagogic) (accessed 3rd January 2017):
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2

Preliminary assessment and analysis of the peers:

For all study programs under review detailed and fairly conclusive overall objectives and learning outcomes have been defined and, along with that, programme-specific qualification profiles. Most specific and in a short, precise way the learning outcomes have been described in the respective Objectives-Module-Matrices oriented along the Subject-Specific Criteria (SSC) of the Technical Committees for Physics and Mathematics. Part of this information is also made publicly accessible to all stakeholders on the website but

not for all study programmes in English language. They are only given for the Bachelor programmes in Mathematics and Physics, as well as for the Master programmes in Physics and Physics (pedagogic). The peers recommended to further improve the international accessibility and visibility of the programmes by expanding the English presentation of the study programmes to the public.

As stated above the peers assessed the objectives and learning outcomes laid down in the SAR to be principally plausible and meaningful notwithstanding certain reservations. Nevertheless, the form of presentation gives a reason for criticism: The descriptions included in the several documents handed in (Diploma Supplements, SAR, Obejctives-Module-Matrices) are partly very extensive, not well structured and, as a result, confusing and difficult to read. Especially with regards to the Physics programmes in the SAR there occurs quite an accumulation of learning outcomes and subject-specific skills that rose doubts as to the possibility to achieve all of these goals (see criterion 1.3).

Nevertheless, on the basis of the more precise descriptions in the module-objective matrices and in the discussions during the on-site-visit the Higher Education Institution (HEI) proved to the peers that the learning objectives for all degree programmes are generally equivalent to the exemplary learning outcomes described in the ASIIN Subject Specific Criteria (SSC). In the Mathematics Bachelor programme students are supposed to receive a sound mathematical knowledge and a profound overview of the contents of fundamental mathematical disciplines. They should be able to recognize mathematics-related problems and have an adequate basic ability to work in a scientific way. Further they shall be enabled to flexibly apply mathematical methods and to create mathematical models, to use basic methods of computer-aided simulation, mathematical software and programming. Referring to the Master programme in Mathematics the peers showed themselves convinced that graduates will in addition to an in-depth mathematical knowledge be able to work out solutions to problems independently being familiar with the main mathematical disciplines, their methodological approaches and their interrelations.

Concerning both Physics Bachelor programmes the peers agreed that according to the described learning outcomes students will have sound knowledge of classical physics and be familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid state physics. However, the peers were of the opinion that the list of aimed at learning outcomes and skills for the Physics Bachelor programmes is very extensive. For example it does pretend to convey aspects of solid state physics but in the curriculum the peers were not able to detect courses where this is especially included. Consequently, the peers deemed it important that such content should be more prominently included while other less fundamental aspects might be reduced. Similarly they appreciated the presence of solar and other renewable energy aspects but missed their

implementation in the concrete curriculum (see also criterion 1.3). Notwithstanding, graduates shall have acquired methods suitable for theoretical analysis, modelling and simulation of relevant processes. More critically assessed were the descriptions of the learning outcomes of the pedagogic track, according to which the programme should "train highly qualified teachers and specialists in the field of Physics" and provide them with the "ability to select the most effective modern methods of physics teaching and learning technology, replying to the actual problems of secondary education national system development". However, in which way this should be achieved is not made clear since no further specifying didactical or pedagogical aims are described. Instead, the peers wondered if knowledge in theoretical (relativity, nuclear physics, plasma physics) and experimental physics (plasma physics, thermal physics) are in such depth necessary for the education of future teachers. In so far they regarded it obligatory to have a clearer distinction of the learning outcomes of the two Physics programmes.

Little more specifically focussed were the described learning outcomes for the Master's programme in Physics (pedagogic) where according to the website it is provided training for specialist teachers in physics including the latest educational technology in teaching and different learning models. However, none of these models or technology were described in any more detail. Speaking of both Physics Master programmes the panel agreed that following the learning outcomes described by the HEI graduates will possess advanced knowledge in natural sciences and mathematics, an overview of inner-physical correlations as well as those with related disciplines, and will have specialised themselves on one field of physics in such a way that they can find access to current international research. Nonetheless, the distinction between the scientific and the pedagogic track is also blurry, since both programmes declare to provide "highly qualified teaching staff". If one of the programmes targets the education of university researchers and teaching staff while the other programme educates teachers for the Kazakh school system this should be expressed in a clearer way and be reflected in the described learning outcomes.

Interdisciplinary and social competences are for all study programmes under review adequately reflected in the compulsory "Social and Communicative Module" as well as in certain aspects of the professional courses, preparing the students to present their research results in oral, written and multimedia supported forms. At the same time they shall gain a thorough understanding of professional ethical principles.

In sum, the peers are of the opinion that the described learning outcomes are generally in line with the ASIIN Subject-Specific Criteria with a few exceptions mentioned above. However, the learning outcomes described especially for the Physics (pedagogic) programmes lack the inclusion of skills and contents that will allow for the cited training of qualified teachers. Further, the peers underline the necessity to present the learning out-

comes of each programme in a clear, precise, and coherent way easily accessible to all stakeholders, most importantly on the faculties' websites.

During the on-site visit the peers further learned that the Faculties' industry partners are well-integrated into process of design and reform of the study programmes. An "industry board" provides suggestions for the improvement of study programmes at the beginning of every study year. In the case of Mathematics a new track (actuarial mathematics) has successfully been introduced due to the demand from Kazakh companies and is now the single most prominent specialization track among the students. In consequence of this close co-operation the peers had no doubts that the learning outcomes of the programmes are in line with industry demand ensuring a secure job perspective for the graduates.

Criterion 1.2 Name of the degree programme

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)

Preliminary assessment and analysis of the peers:

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

Criterion 1.3 Curriculum

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Objectives-module matrix «5B060100 – Mathematics»
- Objectives-module matrix «6M060100 – Mathematics»
- Objectives-module matrix Bachelor Program in Physics 5B060400
- Objectives-module matrix Master degree Program in Physics 6M060400
- Objectives-module matrix Bachelor Program in Physics 5B011000
- Objectives-module matrix Master degree Program in Physics 6M011000

- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics
- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Diploma Supplements
- Lists of Mandatory, Elective and Profession Disciplines for each study programme on the respective website (accessed 4th January 2017):
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/864/1#.

Preliminary assessment and analysis of the peers:
The peers learned that the content of educational programmes in Kazakhstan is to some extent prescribed by the Standards for bachelor and master programmes (GOSO) and other regulations issued by the Ministry of Education and Science, which altogether build a normative framework for designing programmes at the universities in Kazakhstan. In this respect the remaining scope of action of the HEI can only partly be estimated and quantified. Nevertheless, the HEI states that since 2010 through its status of an "autonomous university" it has acquired the right to develop experimental educational programmes which can deviate from the GOSO. Hence, the peers learned that programmes under review are being continuously further developed and deem it laudable to which degree industry representatives are included in this process in order to graduate students who possess the qualities required by local enterprises.

The Bachelor curriculum structure follows for all programmes the same general design. It contains around 45 courses being divided into the state compulsory modules (four courses comprising History of Kazakhstan, Russian and Kazakh language, foreign language and philosophy). The second part is the social communicative module with courses ranging from "psychology" and "culture and religion" to "economics", followed by the STEM

(Science, Technology, Engineering and Mathematics) professional module including basic introductions such as “Mathematical analysis”, “Algebra” and “Calculus”. In continuation students pass on to the core professional modules and the individual major track. Additionally it is offered an interdisciplinary module covering aspects such as “Innovative Entrepreneurship (trade-wise)”, “Intellectual Property Law” or “Culture of Speech and Language Communication”. Internships are generally divided into three variants, pedagogic, industrial and thesis research internships usually as part of an industrial internship. For each of the Bachelor programmes under review students have to pass one pedagogic internship during the first study year and three industrial internships during the second, third and fourth study year. The eighth semester in both Bachelor programmes is entirely reserved for internships and thesis research as well as the writing and defending of the thesis. In the Mathematics Bachelor programme students choose from six specialized tracks (“Mathematical Analysis and Function Theory”, “Mathematical logic and algebra”, “Stochastic Analysis and Actuarial Mathematics”, “Differential equations”, “Optimization and optimal control”, “Equations of mathematical physics”) each comprising of five modules. The Physics Bachelor programmes offer three specialization tracks (“Theoretical Physics”, “Plasma Physics” and “Thermal Physics”). In both programmes each track comprises five modules with the only difference being that in the pedagogic programme each track includes one module with a pedagogic focus such as “Computer Models in Schools Course Practice”, “Innovation Methods of Educational Works” or “Methods of Educational and Experimental Works”. The number of internships in both programmes remains equal.

The Master programmes follow a structure of three columns, State Compulsory, Compulsory Professional and Elective Professional Modules. They also include a variety of internships (two with Mathematics, four with Physics) divided into pedagogic, research and industry internships. The State Compulsory Module contains again courses on History and foreign languages as well as pedagogy. The programme of Mathematics continues with three modules on “Methods of teaching mathematics”, “Mathematical and stochastic analysis” and “Algebraic structures”. In continuation students elect from six tracks (“Differential equations and mathematical physics”, “Control theory”, “Mathematical analysis and function theory”, “Actuarial mathematics”, “Stochastic analysis” and “Mathematical logic and algebra”). In the Physics Master programmes a stronger differentiation between the scientific and the pedagogic programme was noticed by the peers. In the scientific programme the Basic Professional Modules (“Research organisation”, “Modern Physics and Field Theory” and “Computer Modelling and Experimental Physics”) are followed by an election between three specialized tracks resembling those from the Bachelor programme. However, the peers learned that students do not necessarily have to continue

the track they have chosen at Bachelor level. In the pedagogic programme the Basic Professional Modules comprise “Different types of teaching methods” as well as “Science and education”. In continuation students elect one of two tracks focussing on “Plasma physics in education system” or “main physical courses in teaching method”, each consisting of four modules. Although the peers appreciated this stronger focus on didactical and pedagogical aspects they wondered at the prominence of Plasma physics in a curriculum dedicated to instruct future school teachers. The programme co-ordinators explained satisfactorily that this is merely a coincidence with the intention to convey the didactical treatment of one special aspect of Physics which might have been anything else.

Along with the SAR the peers received for each study programme an Objectives-Module-Matrix detailing for all courses available the learning outcomes and matching them with the Subject-Specific Criteria of ASIIN. Consequently the peers came to the following conclusions: The curriculum of the Bachelor programme Mathematics provides an adequate mediation of sound mathematical knowledge and a profound overview of the contents of fundamental mathematical disciplines. Through the Compulsory Professional and Elective Professional courses the students know how to formulate and solve problems associated with their professional functions, as well as how to work with the basics of mathematical modelling. In the Master’s Mathematics programmes the learning outcomes are equally met. Especially in the elective tracks the students get acquainted with the application of theoretical knowledge and are enabled to solve theoretical, scientific practical and information search-related mathematical tasks. They have to solve complex interdisciplinary problems and can construct standard mathematical and computer models of physical, technical, economic and other processes. In the Physics Bachelor programme the curriculum guarantees that students possess sufficient knowledge of advanced laws and principles of physics as well as mathematical and numerical methods. They also gain the ability to use contemporary software, computer mathematics packages and programming languages for solving problems in the field of Physics. The correlating Master programme in Physics enhances the students’ skills as to have an in-depth specialized knowledge and understanding of processes and phenomena in physics. They gain the ability to generate new ideas and hypotheses and to engage them in modelling applying effective theoretical models, mathematical and numerical techniques as well as software packages and algorithms. However, as already mentioned under criterion 1.1 the peers remarked that the aspect of solid state physics is not sufficiently included into either Physics curricula and should be strengthened. Equally it might be worthwhile to expand the course offer with regards to solar and other renewable energy aspects that are mentioned in the list of envisaged skills but are only randomly present in the curricula. In the discussion with the programme co-ordinators the peers gathered that the above-mentioned aspects are in-

deed part of some courses but it could not be clearly identified in which and to what amount. Hence, the peers underlined the necessity to increase these contents in such a way that they are a clearly identifiable part of the curricula thus matching the described learning outcomes.

While the content-related criteria of the Physics programmes are likewise met by the pedagogic programmes the peers detected a certain incongruity regarding the envisaged jobs perspective, the learning outcomes and the curriculum (see also criterion 1.1). In the case of the Bachelor programme Physics pedagogic the purpose of training highly qualified teachers and specialists in the field of Physics, giving them the abilities and skills for their professional activity the curriculum does not include sufficient courses to achieve this. With only three courses of any visible didactic content and the usual pedagogic internship during the first study year the peers see only little overlap with the referred qualifications. They emphasize the importance to restructure the curriculum in accordance with the described purposes, thus introducing a clear distinction to the learning outcomes and purposes of the scientific programme. Most importantly they see the necessity to increase the number of pedagogic internships involving students in an active way in the teaching process and preparing them for their future work task.

That a more specialized focus is possible could clearly be seen from the Master's curriculum of the Physics pedagogic programme that perfectly matches the Programme's purpose to provide training for specialist teachers in accordance with the highest academic standards. Through the combination of compulsory and elective courses it is ensured that graduates not only have an in-depth specialized knowledge and understanding of processes and phenomena in physics but also an adequate training in didactical and pedagogical techniques.

Criterion 1.4 Admission requirements

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Admission regulations in English language on the University website (accessed 06.12.2016): http://kaznu.kz/content/files/pages/folder486/student%20admission%20model%20rules.pdf

Preliminary assessment and analysis of the peers:

Information on the admission regulations for all study programmes were presented in the SAR, additional documentation is also published on the University website. The admission procedure for the Bachelor programmes is mostly governed by regulations issued by the Ministry of Education and conducted through a nationwide unified exam after completing their High School or Professional School Diploma. The Unified National Test (UNT) includes the examination of Kazakh and Russian, Mathematics, History of Kazakhstan and one elective subject, depending on the chosen specialty. Depending on national demand the Ministry of Education sets a limited amount of scholarships for each Bachelor programme offered to those with the highest score. Those applicants above the required minimum score at KazNU of 70 but without a state scholarship have to pay themselves for their study fees.

Admission to the Master programmes is carried out in a similar way. Applicants have to pass a national exam covering a second language (English, German or French) and a specialized exam in their respective discipline. National scholarships set for each subject are offered to those with the best results. In addition KazNU requires for admission to the Master's programmes in Mathematics and Physics a Bachelor degree in Mathematics, Information Sciences, Mechanics, Physics, Nuclear Physics, Information Systems, Computational Equipment and Software or Mathematical and Computer Modeling.

In general, regarding the ASIIN criteria the audit team considers the admission standards and procedures to be beneficial for the achievement of the intended learning outcomes. The peers got the impression that the students are informed about the terms and conditions upon which they can apply for a study program at KazNU. Moreover, the auditors see that the legal framework is well defined and easily accessible for all relevant stakeholders on the university's website.

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

The peers approved that the HEI has in the meantime much improved the English presentation of the study programmes indicating the objectives and learning outcomes on the website in English language. By this measure they also agreed that an improved coherency of the description of the learning outcomes in different forms of presentation has been achieved. Additionally, the descriptions of the learning outcomes for Bachelor and Master degree programme in Educational Physics have been revised. Notwithstanding, the peers underline that regarding the Physics pedagogic programme it must be made clear in the description of job perspectives as well as teaching methods that graduates are not only able to act as university teachers but also as school-teachers.

Further, the peers welcome the introduction of a variety of new courses specialized on pedagogic and didactical aspects to the curricula of the Bachelor and Master Physics (Pedagogic) programmes. Consequently, they agreed that their demand for a stronger pedagogic accentuation has been dealt with. The peers also learned that the pedagogic work practice has been increased up to 240 hours in the bachelor programme. Thus, they considered this criterion as fulfilled.

Concerning the aspect of solid state Physics in the scientific Physics Bachelor programme the peers understood that two additional courses named “Solid state physics” and “Renewable and Traditional Energetics”, which form the knowledge of solid state physics and renewable sources of energy, have been added to the curriculum. However, they emphasized, that these additional courses should, of course, form part of the Physics scientific programme, not of the pedagogic programme. Hence, this criterion has been fulfilled.

In conclusion, the peers agreed that the aspects of this criterion have been partly fulfilled.

2. The degree programme: structures, methods and implementation

Criterion 2.1 Structure and modules

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Objectives-module matrix «5B060100 – Mathematics»
- Objectives-module matrix «6M060100 – Mathematics»
- Objectives-module matrix Bachelor Program in Physics 5B060400
- Objectives-module matrix Master degree Program in Physics 6M060400
- Objectives-module matrix Bachelor Program in Physics 5B011000
- Objectives-module matrix Master degree Program in Physics 6M011000
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics

- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Diploma Supplements
- Lists of Mandatory, Elective and Profession Disciplines for each study programme on the respective website (accessed 4th January 2017):
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/864/1#.
- Audit discussions

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

For all programmes the peers learned that a great variety of elective study options is offered in addition to the basic compulsory courses defined by the Ministry. The peers got the impression that the study programmes' electives are being constructed in a very individual and flexible way, leaving sufficient space for the enhancement of each student's particular interest. Given the great number of electives in each programme the peers learned that they are usually all offered every semester but do only take place if a group of five students or more wants to participate. This is of particular importance since all courses have to be generally available in Kazakh, Russian and English. In consequence not every elective can be offered in each language every semester. Notwithstanding, the peers learned from the discussion with the students that they are content with the electives on offers and the regularity of their repetition in the languages required.

Furthermore, the programmes are being constantly revised in co-operation with industry representatives in order to improve the existing offer or to introduce new electives in the case of changing demands from the part of the future employers (see also criterion 1.1). In general, the peers were convinced, that the programme structures allow for an individual yet goal-oriented order of study in the designated time.

Internships form part of each of the programmes under review. However, as has already been mentioned above the peers were of the opinion that the practical part of the Bache-

lor programme in Physics pedagogic is not sufficient and should be expanded in order to deepen the graduates' pedagogic experiences before entering the job market. For the internships a system of joint supervision has been introduced. Students are partly supervised by a member of the faculty's teaching staff and partly by a representative of the company. All responsibilities are clearly defined in a signed agreement between the partaking stakeholders at the beginning of the internship.

Working practice in form of laboratory work is part of many modules in all programmes and cooperation with industrial partners in the development of assignments and theses allows for a vivid experience of practical work issues. Conclusively and based on the analysis of the curricula and the module descriptions, the peers confirmed that the module objectives and the respective content help to reach both the qualification level and the overall intended learning outcomes of the respective programmes. Again some restrictions were made by the peers in relation to the Bachelor Physics pedagogic programme. With only three courses of any visible didactic content it has to be doubted whether the practical aspects of teaching, didactic communication and writing are adequately trained during the contact hours. A precise description of such activities could neither be found by the peers in the module descriptions. Consequently, they saw great demand for the introduction of more specifically pedagogic courses or at least the introduction and strengthening of clearly defined didactic parts in the already existing Physics pedagogic modules.

International mobility is of huge importance to KazNU given its interest in greater international visibility. Students of all study programmes under review are strongly recommended to spend at least four months at an international university, although it appears that this is not often followed. There is no specifically designated mobility window in the curricula but the peers understood that individual solutions are usually found in accordance with the students' study plan. Apart from full-semester exchanges all students have the opportunity to partake in a full-sponsored two-week summer exchange at foreign universities. The peers learned that most of the students have already partaken in this programme that allows for first contacts with international mobility. However, given the HEIs great ambitions a stay of two weeks cannot adequately convey much international experience, although the peers were convinced that a great variety of offers to go abroad does already exist at KazNU. Any department has a vice-dean for international co-operations as well as every chair, there is also a website where all information is available and students may consult with the student office on questions of international mobility. Nevertheless, in the discussion with the students the peers understood that several students willing to go abroad for a longer time period were uncertain about their options and especially any financial subsidies while others felt perfectly well-informed. The peers received the im-

pression, that due to the great variety of offers many students lack an adequate overview, most of all since some of the smaller but well-funded programmes are often mediated through one professor alone who approaches the qualified candidates on his own initiative. Although the peers welcome the direct contact between professors and students they deemed it recommendable to further institutionalize the information processes as well as to bundle the many projects available for an easier approach by the students.

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

Criterion 2.2 Work load and credits

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics
- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Lists of Mandatory, Elective and Profession Disciplines for each study programme on the respective website (accessed 4th January 2017):
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2

- http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2#.
- http://www.kaznu.kz/en/education_programs/magistracy/speciality/864/1#.

- Audit discussions
- ECTS User's guide

Preliminary assessment and analysis of the peers:
The calculation of workload and ECTS credits has proven difficult to bring into accordance with the Kazakh calculation system of credit points. Nevertheless, since 2010 Al-Farabi University has started to apply the ECTS calculation of workload, at least for the recognition of student mobility activities. In the SAR the HEI has provided a detailed but nevertheless complicated description of their transmission of Kazakh credit points to ECTS credit points. As far as the peers understand this complication is mainly due to the varying coefficients applied to different forms of work (i.e. theoretical study, practical and laboratory work, etc.). This results in the diverging designation of credits and total workload for some of the courses in comparison to their respective value in Kazakh credit points. Hence, for example in the Master's programme in Physics a research internship is valued at 1 ECTS per 30 hours of workload while a research seminar is calculated at 40 hours per ECTS credit point but these were considered minor transfer difficulties, since generally 1 ECTS credit seemed to have been awarded to 30 hours of workload.

However, the peers got the impression that in the amount of presented documents a coherent presentation of the calculation was lacking and that the number of credits awarded by each module differed significantly. For example, according to the SAR and the Diploma Supplement the preparation of the Bachelor thesis is awarded 12 ECTS credits in addition to 7 ECTS credits for a pre-diploma research internship. Following the individual module descriptions the "Preparation and Presentation of Bachelor's Thesis" is valued at 5 ECTS credits, the course "State Exam" is awarded 4.5 credits and the pre-diploma practice is awarded 7.5 credits, summing up to a total of 17 credits. The peers insisted that these incongruities must be avoided in order to fully comply with the ECTS System.

Notwithstanding, the peers got the impression, that for the Bachelor and Master programmes the estimated time budgets are more or less realistic. Workload (however it may be calculated) is given at more or less 30 ECTS per semester for all study programmes and in the discussion with the students they appeared to be sufficiently content with the workload required. In the discussion with the students they assessed their personal weekly workload at an adequate average somewhere between 35 and 50 hours. In sum, the auditors see no evidence for serious structural problems.

Criterion 2.3 Teaching methodology

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics
- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Audit discussions

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

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

Lectures are methodologically dominated by direct instruction through the teacher who further explains the recommended readings but also opens class discussions. In the tutorials and group works a variety of practical problem-solving activities are employed. Additional handouts and material is offered to the students on the course website. Discussions and presentations are used to enhance the student's abilities in team work or their presentation skills.

The teaching methodology varies between bachelor and master level. The peers understood that at bachelor level most of the courses during the first years consist of chiefly theoretical knowledge while the number of practical classes increases during the advancement of the study programme. At master level the individual scientific research is further promoted and students are encouraged to get actively involved in challenging assignments to find concrete solutions. Therefore they receive tasks and materials for the

respective disciplines to organise and realise their work independently. This increasingly independent work is often conducted in collaboration with local research institutes where students of Bachelor, Master and PhD level work jointly on projects according to their knowledge level supervised by professional experts. The peers expressly appreciated this hands-on learning approach.

Apart from the practical parts of the courses students of all study programmes are also prepared for work through a variety of compulsory industrial as well as educational internships. Internships are developed in an exemplary way by cooperation with local and national industry partners who affirmed during the discussion with peers that they are regularly involved in the construction of the study programmes. The peers were confirmed in their assessment that the programmes under review are very outcome oriented towards the need of Kazakh employers. For the internships a contract is signed between the department, the industry partner and the student to ensure the legal status of the stakeholders and the results of the internships are equally controlled by a University and an enterprise supervisor. Despite their appreciation of the close co-operation with Kazakh research institutes and some industry partners the peers learned little about co-operations with free market enterprises who might employ future graduates. While experience in research was deemed of great importance by them they recommended to further expand the faculties' partners in this regard. As mentioned above the peers also criticized the lacking didactic coaching of students in a theoretical as well as practical sense during the Bachelor Physics pedagogic programme. According to the panel this should be emphasized as part of the teaching methodology as well as the compulsory internships.

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

Regarding the teaching language the peers learned that students can principally voluntary to study in Kazakh, Russian, and English. Every course is taught simultaneously in three languages, sometimes by same teacher, sometimes by different teachers depending on subject. This new tri-lingual policy is extremely important for the Physics pedagogic programme since the peers learned that the government has decided to start teaching some subjects such as Physics in English in Kazakh schools. The prestigious Nasarbaev Intellectual schools have already started to do so and consequently future teachers are required an expert level in English. The peers were generally impressed by the advanced English-speaking level among the teaching staff as well as the students, many of whom study

completely in English. A problem noticed by the peers instead was the availability of teaching and research literature in English. Although they were assured that necessary reading could always be translated most of the literature present in classrooms during the on-site visit was not available in English, an aspect that should be further improved (see also criterion 4.3).

In conclusion, the auditors were convinced that (with some exception for the Physics pedagogic Bachelor programme) the teaching methods and instruments support the students in achieving the learning outcomes, that the programmes are well-balanced between attendance-based learning and self-study and that independent academic research and writing are promoted in all of them.

Criterion 2.4 Support and assistance

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Audit discussions

Preliminary assessment and analysis of the peers:
The peers learned that for each degree programme students are divided into groups that receive their own curator-advisor. Academic advisors are lecturers and professors of the university. The task of the academic advisor begins during the freshman year and continues throughout to the senior year. When starting the study programme, first-year students receive a Students' Guideline which contains all relevant information about the educational process, the national credit system, structural units of the university, general requirements to the students, their rights and obligations, main provisions of monitoring and evaluation of students' knowledge etc. The academic advisor provides academic advice in terms of courses to be selected; additionally, the he also supports students regarding personal matters. The students confirmed that the advisors were very supportive and tried to assist the students in all matters. Additionally, students can always approach senior professors, lecturers and other faculty members for advice and assistance what they declared to do regularly and without restraint.

Students receive all necessary information from the university's website. The "Intranet" system located at http://univer.kaznu.kz hosts complete information on the academic process, news, announcements etc. The system is supposed to allow online course registration, examination of course curricula, course schedules, students' individual curricula and transcripts, access to educational documents and tutorials, as well as review of aca-

demic performance. In conclusion, the peers were convinced that students receive all the necessary support and assistance from the part of the HEI.

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

The peers learned that concerning the international mobility the students may gather all relevant information on programmes, co-operations and funding options from the web-site of the International Cooperation Department http://icd.kaznu.kz/3/Main/RightNodeBrowser/70. The information there provided was considered as adequate.

Regarding the detected inconsistencies of the calculation of ECTS-credits in different documents the HEI has made certain changes in the provided Self-Assessment-Report. However, the peers retain their demand to synchronize the ECTS-calculation in all relevant and publicly accessible documents such as the module handbook, the information on the website as well as the diploma supplement.

Concerning the faculty's co-operation with industry partners the peers understood that a variety of independent enterprises are acting as partners on the university's as well as the faculty's Council of Employers giving advice in the improvement of study programmes as well as offering work practice places. Therefore, the peers were convinced that these co-operations are adequate and considered this aspect as fulfilled.

Consequently, the peers considered this criterion in total as partly fulfilled.

3. Exams: System, concept and organisation

Criterion 3 Exams: System, concept and organisation

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics

- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Audit discussions

Preliminary assessment and analysis of the peers:
Student learning progresses are regularly documented in all study programmes under review in form of midterm and final exams which can be held in oral or written form as defined by the responsible lecturer. All amounts and forms of assessment are made public beforehand on the intranet available to the students. After the first accreditation of the study programmes in Physics and Mathematics in 2010 it was required that binding examination regulations to which students can refer were developed and provided for each programme. Since the students were perfectly aware of the existing regulations and affirmed that they knew where to find them in a legally binding form the peers were convinced that the old requirement has apparently been met. Nevertheless, they panel itself had no access to the Intranet documents and has thus not been provided with the regulations in effect. These need to be handed in additionally.

Further interim control is held in the form of quizzes, tests, presentations, essays, class discussions, roundtables, simulations and other assignments. Each module is assigned 100 points. The maximum number of points a student can collect as a result of two interim controls is 60, or 30 for each interim control. To be allowed to take a final examination, a student must collect not less than 30 points. The maximum number of points a student can get for a final examination is 40. A student's final grade depends on the total number of collected points. At the end of each semester students may have up to eight exams in a limited examination period of ten days what has been considered very intense by students and peers alike. Although most students agreed that an adequate preparation for the exams was possible the peers recommended considering a slightly extended examination period allowing for a recreation day between the exams. All in all the students in general were content with the amount of exams and the workload attached to their preparation. In order to achieve greater objectivity student examination is divided among three staff members: one who teaches the course, one who attends the examinations and a third who corrects the written tests.

The peers understood that if students fail an exam they have to re-take the course the following year and pay for the repetition under the condition that at least five out the course have to repeat, otherwise students have to wait until the course is offered the next time; therefore students do not fall out of the curriculum but the time concept is such that repetitions are usually possible during the same semester in order not to loose time; if students fail for second time they loose their scholarship and may switch to the

privately paid programme. However, once a course is taken the student eventually has to pass it and cannot change it for another course (with the exception of the electives).

At the end of the Bachelor programmes students also have to take a final examination on general topics such as History and languages in addition to subject-specific elements. This exam was constituted by the Ministry of Education. However, the peers learned that this exam is going to be terminated at the end of this academic year.

All study programmes do include a Bachelor or Master theses and the peers were convinced that the time invested for their preparation is absolutely sufficient (based on several research internships and time for preparation and defense of the theses) in volume and quality.

In conclusion, the peers agree that apart from the accumulation of exams in a limited time period they are in system, concept and organisation well-devised to individually measure to which extent students have reached the learning outcomes defined.

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

The peers understood that all students have access to the necessary information on exam regulations through the Intranet UNIVER system. Further, all basic regulations are made accessible online in English language on the University website. Hence, the peers considered this criterion as fulfilled.

4. Resources

Criterion 4.1 Staff

Evidence:

- Staff handbooks for all study programmes
- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics

- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Presentation of teaching staff on the website only in Russian/Kazakh language (accessed 04.01.2017):
    - http://pps.kaznu.kz/2/Main/Chair/33
    - http://pps.kaznu.kz/2/Main/Chair/51

Preliminary assessment and analysis of the peers:
Along with the information in the SAR the HEI presented detailed staff handbooks for all study programmes. On this basis the peers were convinced that the quantity of the staffing level was sufficient to properly sustain the degree programmes. Regarding the average ratio of students to teachers this is defined by the Law of Education for all HEIs in Kazakhstan. Notwithstanding, the peers raised the concern, that the presentation of staff members at KazNU in different documents and on the website is not totally consistent and not accessible in English language. For reasons of international visibility a coherent display mode would be strongly recommendable.

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

Criterion 4.2 Staff development

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Audit discussions

Preliminary assessment and analysis of the peers:
The HEI proved that there are offers and support mechanisms available for the teaching staff who wish to further develop their professional and teaching skills. The peers understood that there is a centre of qualification improvement open to all teaching staff. The teachers can also apply for sabbaticals which are generally a possibility. However, the peers learned from discussion with the staff that an application to any sabbatical pro-

grammes is quite complicated and rarely made use of. Once a grant is given substitution of the teaching capacity is guaranteed by the university. An important issue in the development of the staff is the improvement of English language skills. All teachers have to attend a month of special English training before they pass an English exam as to assure their skills. To further improve the knowledge level in English as also subject-specific the university offers funds to invite foreign experts who give classes and help to improve the language skills. Similarly staff members are offered subsidies to take private English classes. The peers welcome that there will also be introduced a new study track where foreign professors are being invited to teach and also to instruct the local staff in teaching methodology. In conclusion, the peers were convinced that a variety of development offers exists and that staff members regularly partake in these offers. Notwithstanding, they would recommend to further enhance the possibilities for teaching staff to go on sabbaticals in order to pursue their individual research projects.

Criterion 4.3 Funds and equipment

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Visitation of the laboratory facilities
- Audit discussions

Preliminary assessment and analysis of the peers:

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

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

Concerning the equipment available at the faculty the peers got the impression that it was generally adequate for the transmission of the learning outcomes aimed at. The number of computers and their equipment seemed in order. While the peers were uncer-

tain if up-to-date software such as “Matlab”, “Mathematica” or “R” were regularly used the teaching staff assured that they were. The peers therefore asked for an updated list of the Software programmes available to be handed in additionally. Further room for improvement was detected by the peers with regard to the available English-speaking literature. In the last accreditation of the programmes in 2010 it was recommended that more English language literature was provided and the peers did get the impression the some improvements have been achieved. Nevertheless, especially under the condition that all study programmes can be studied completely in English, there is still work to be done. Special emphasis was laid by the peers on the importance of International Review Journals in Mathematics that should be present if the target of stronger international comparability shall be reached. It was equally understood that for the courses held in English the required literature was usually provided in translation or abstracts in the Intranet. While this was considered generally helpful the peers recommended that for each course at least the most relevant books and articles should be available in the library.

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

According to the HEI the information about the teaching staff of the degree programmes have been updated on the website. However, for the Physics programmes no information have until now been added and parts of the Mathematics staff still offer no information. Anyway, the peers appreciated the effort and were convinced from what was already there that the form of presentation once concluded will very much improve the faculty’s transparency.

The peers understood from the regulations provided by the HEI that sabbaticals follow a regulated procedure and are open to all professors at the faculty. Since they learned during the on-site-visit from the staff that the procedure was considered quite complicated they still recommend to at least improve the internal communication about the process of application.

The peers appreciated that a list of literature in foreign languages available at the university as well as the literature that will be purchased in the nearest future has been provided. In addition they received more information about the Software programmes available to the students. Although this was considered by the peers as helpful they nonetheless considered it important to strengthen the research through the accessibility of international Review Journals in English language.

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

5. Transparency and documentation

Criterion 5.1 Module descriptions

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Module Catalogue Programme Code 5B060100 – Mathematics
- Module Catalogue Programme Code 5B060400 – Physics
- Module Catalogue Programme Code 5B011000 – Physics (pedagogic)
- Module Catalogue Programme Code 6M060100 – Mathematics
- Module Catalogue Programme Code 6M060400 – Physics
- Module Catalogue Programme Code 6M011000 – Physics (pedagogic)
- Lists of Mandatory, Elective and Profession Disciplines for each study programme on the respective website (accessed 4th January 2017):
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/707/1
    - http://www.kaznu.kz/en/education_programs/bachelor/speciality/712/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/812/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/9/2#.
    - http://www.kaznu.kz/en/education_programs/magistracy/speciality/864/1#.

Preliminary assessment and analysis of the peers:

Together with the SAR the HEI provided module descriptions for all study programmes. Although these descriptions contain the majority of required information concerning the persons responsible, the description of the course content, a detailed account of the division of work load, credit points, learning outcomes, admission and examination requirements, the forms of assessment and information on the calculation of the module mark, as well as recommended literature the peers did see some room for improvement. Apart from some translation errors causing deviations between module handbook and curriculum the inconsistency of information with respect to the number of ECTS-credits awarded to the respective courses needs to be rectified. The module descriptions also contain too much detail information regarding the course contents thus impeding a concise impression of the module with descriptions stretching over five and more pages. Although a de-

tailed plan of the study programme is desirable for all students and might be made accessible via the Intranet beforehand, the module descriptions should be presented in a compact and precise way that allows grasping all the most important information on a short glance. Furthermore, there are courses listed in the curriculum such as “Biophysics and Foreign Language” in the Bachelor degree Physics that do not appear in at all in the module descriptions. Also the reading list of each module should be shortened to an adequate amount. Finally the HEI should ensure that the module descriptions are available for all relevant stakeholders online. At the moment at least in the English translation of the website, there are lists provided naming all the courses but only few of them also entail a short description of the course content.

Criterion 5.2 Diploma and Diploma Supplement

Evidence:

- Diploma Supplements presented in the SAR

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

Criterion 5.3 Relevant rules

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Audit discussions

Preliminary assessment and analysis of the peers:
The peers learned that the determination of overall study conditions as well as large parts of the structure and content of the educational programmes takes place in a generally binding framework provided by the Ministry of Education. Furthermore, the HEI presented in the SAR general provisions for student and staff life at KazNU such as the “Corporate Culture Code”, the “Student Code of Honor” and the Curator-Advisor-Provision made between Students and their Advisors. From these documents the peers got the impression that strict regulations for study life at KazNu are well implemented and play an important part in the University life cycle. Provision regarding admission, study progres-

sion and graduation are supposedly published on the University website but are often missing in English translations or website links are not working. The same is valid for the rules and regulations concerning study content, exams or international exchange. The peers came to the conclusion that a general overhaul of the website with respect to English translation, structure and topicality is necessary in order to guarantee that all stakeholders and people from the outside interested in the study programmes have access to the information required. That is especially important considering the internationalization process envisaged by the HEI. Regarding the recognition of qualifications gained at another university the programme coordinators stated that this is generally possible. However, the peers ask that an example of the legally binding recognition regulations shall be provided in the course of the accreditation procedure.

Special attention was paid by the peers to the availability of binding examination regulations to which students can refer as had been an important requirement during the last accreditation procedure in 2010. During the discussions with students and staff members it became clear to the peers that such regulations do exist and are accessible by all university members through the Intranet. Especially the students were perfectly informed about these rules. Nevertheless, since the peers do not have access to the Intranet they ask that an English translation of the regulations shall be provided to them.

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

Concerning the module descriptions the peers agreed that some substantial improvements have already been made. However, the peers maintain their criticism that the presentation of the module descriptions has to be much more concise to make them easily accessible to all stakeholders. Therefore, they considered this aspect as not yet fulfilled.

Updated Diploma Supplements have been presented in an adequate form. All exam regulations are made accessible via the University website as well as the Intranet UNIVER system. Concerning the legally binding recognition of qualifications gained at other universities the peers agreed that these were referred to in the respective regulations on academic mobility. However, they did not consider it sufficient to simply state that the regulations comply with the principles of the Lisbon convention but that it should be made explicit what these regulations imply.

Consequently, the peers considered this criterion as not fulfilled.

6. Quality management: quality assessment and development

Criterion 6 Quality management: quality assessment and development

Evidence:

- Self-Assessment Report (SAR) for Cluster E, Bachelor and Master Degrees in Mathematics, Physics and Physics (pedagogic)
- Audit discussions

Preliminary assessment and analysis of the peers:
From the SAR and the discussions during the on-site visit the auditors gained a satisfying impression of the Quality Management processes active at KazNU. Since the last accreditation in 2010 recommended further to realize the Quality Assurance concept the peers asked if some statistical data were available for the past years documenting the results and improvement of the Quality Management process. The programme coordinators promised to additionally present such documentation. The peers learned that each semester a survey is implemented in order to evaluate the study courses. Students grade their teachers with 1 to 5 points on 25 categories concerning aspects such as study material, appearance of the teacher, corruption, teaching quality, relevance of content, etc. The peers asked, if an English translation of the questionnaire might be provided in addition. 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. The peers opined that to enhance the transparency the HEI should inform the students not only of the average grade of the teacher but of the detailed results of the evaluation thus closing any remaining feedback loops. Further, the communication of the quality management processes in work should be strengthened thereby involving more students in an active participation.

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

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

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

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

From the comments of the HEI the peers learned that a strong emphasis is made to continuously evaluate not only the study courses but also to implement a general survey including students, alumni and employers. These efforts are very much appreciated by the peers who only recommend to keep trying to include as much students as possible in the evaluation process. This notwithstanding the peers considered this criterion as fulfilled.

D Additional Documents

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

1. Examples of a Student survey Questionnaire
2. Statistical data for the past years concerning the results and their improvement of the Quality Management process
3. An updated list of the Software programmes available
4. The examination rules that are available online need be made accessible to the peers
5. Intake and dropout rates of the Physics programmes
6. Legally binding regulations for the recognition of qualifications gained at other universities

E Comment of the Higher Education Institution

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

F Summary: Peer recommendations

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditaiton
Bachelor's degree of Mathematics	With requirements	-	30.09.2024
Master's degree of Mathematics	With requirements	-	30.09.2024
Bachelor's degree of Physics	With requirements	-	30.09.2024
Master's degree of Physics	With requirements	-	30.09.2024
Bachelor's degree of Physics (pedagogic)	With requirements	-	30.09.2022
Master's degree of Physics (pedagogic)	With requirements	-	30.09.2022

Requirements for all study programmes

A 1. (ASIIN 5.1) Make sure all modules, including internships and thesis modules have a module description available to all relevant stakeholders. Rewrite the module de-

scriptions so as to include information on the qualification objectives, admission requirements, and an individual course responsible. Furthermore, the reading list of each module should be reduced to an adequate amount. At the same time, the description of the learning outcomes and the course contents should be significantly reduced in order to achieve a concise presentation.

A 2. (ASIIN 2.2, 5.1)The calculation of ECTS-credits and their indication has to be consistent in all forms of presentations, especially on the website, in the module handbook and the Diploma Supplement. Thereby it should be considered that 1 ECTS credit is equivalent to 25-30 working hours.

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

Requirements for the Bachelor of Physics (pedagogic) programme

A 4. (ASIIN 1.1) Ensure that the description of learning outcomes and educational objectives makes clear that the programme not only aims at the education of university teaching staff but also of school-teachers.

Recommendations for all study programmes

E 1. (ASIIN 6) It is recommended to strengthen the communication of the quality management processes in work thereby trying to involve more students in an active participation. The students should know the detailed results of the questionnaire and not just the general mark. The feedback loop process should be regularly controlled and summarized in a report accessible to all stakeholders.

E 2. (ASIIN 4.1) It is recommended to secure a consistent presentation of staff members at KazNU in the relevant documents as well as on the website in English language.

E 3. (ASIIN 5.3) It is recommended to further improve the international accessibility and visibility of the programmes by expanding the English presentation of the study programmes on the website.

E 4. (ASIIN 4.3) It is recommended to strengthen the international research direction through the accessibility of at least one International Review Journal for Mathematics and one for Physics.

G Comment of the Technical Committees (15.03.2017)

Technical committee 13 – Physics

Assessment

The technical committee discusses the procedure. Regarding the recommended consistent presentation of the staff members it talks note, that “relevant documents” only refers to the staff handbook. As an English staff handbook has to be presented on occasion of the re-accreditation anyway, the technical committee deems this part of the respective recommendation 2 dispensable. In all other aspects the technical committee confirms the proposal for a decision of the peer group.

The technical committee 13 – Physics recommends the award of the seal as follows:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditaiton**
Bachelor’s degree of Physics	With requirements	--	30.09.2024
Master’s degree of Physics	With requirements	--	30.09.2024
Bachelor’s degree of Physics (pedagogic)	With requirements	--	30.09.2022
Master’s degree of Physics (pedagogic)	With requirements	--	30.09.2022

Technical committee 12 – Mathematics

Assessment

The Technical Committee discusses the procedure and follows entirely the assessment of the peers.

The Technical Committee 12 – Mathematics recommends the award of the seals as follows subject to the final assessment of the peers:

Degree Programme	**ASIIN-seal**	**Subject-specific label**	**Maximum duration of accreditaiton**
Bachelor's degree of Mathematics	With requirements	-	30.09.2024
Master's degree of Mathematics	With requirements	-	30.09.2024

H Decision of the Accreditation Commission (31.03.2017)

Analysis:
The Accreditation Committee discusses the programmes and completely follows the recommendations made by the peers as well as the Technical Committees.

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

Degree Programme	ASIIN-seal	Subject-specific label	Maximum duration of accreditation
Bachelor's degree of Mathematics	With requirements for one year	-	30.09.2024
Master's degree of Mathematics	With requirements for one year	-	30.09.2024
Bachelor's degree of Physics	With requirements for one year	-	30.09.2024
Master's degree of Physics	With requirements for one year	-	30.09.2024
Bachelor's degree of Physics (pedagogic)	With requirements for one year	-	30.09.2022
Master's degree of Physics (pedagogic)	With requirements for one year	-	30.09.2022

Requirements for all study programmes

A 1. (ASIIN 5.1) Make sure all modules, including internships and thesis modules have a module description available to all relevant stakeholders. Rewrite the module descriptions so as to include information on the qualification objectives, admission requirements, and an individual course responsible. Furthermore, the reading list of each module should be reduced to an adequate amount. At the same time, the description of the learning outcomes and the course contents should be significantly reduced in order to achieve a concise presentation.

A 2. (ASIIN 2.2, 5.1)The calculation of ECTS-credits and their indication has to be consistent in all forms of presentations, especially on the website, in the module hand-book and

the Diploma Supplement. Thereby it should be considered that 1 ECTS credit is equivalent to 25-30 working hours.

Requirements for the Bachelor of Physics (pedagogic) programme

A 3. (ASIIN 1.1) Ensure that the description of learning outcomes and educational objectives makes clear that the programme not only aims at the education of university teaching staff but also of school-teachers.

Recommendations for all study programmes

E 1. (ASIIN 6) It is recommended to strengthen the communication of the quality management processes in work thereby trying to involve more students in an active participation. The students should know the detailed results of the questionnaire and not just the general mark. The feedback loop process should be regularly controlled and summarized in a report accessible to all stakeholders.

E 2. (ASIIN 4.1) It is recommended to secure a consistent presentation of staff members at KazNU on the website in English language.

E 3. (ASIIN 5.3) It is recommended to further improve the international accessibility and visibility of the programmes by expanding the English presentation of the study programmes on the website.

E 4. (ASIIN 4.3) It is recommended to strengthen the international research direction through the accessibility of at least one International Review Journal for Mathematics and one for Physics.

Appendix: Programme Learning Outcomes and Curricula

The following **curricula** are presented:

For the Bachelor programme Mathematics:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercise	Laboratory	Total	Total in	Theory	Practice - Exercise	Laboratory	Total	ECTS
	Core courses										
1	History of the republic of Kazakhstan (State Examination) - State Compulsory Module	2	1	0	3	15	2	1			3
2	Kazakh(Russian) Language for Professional Purposes - State Compulsory Module	0	3	0	3	15	0	3			3
3	Foreign Language for Professional Purposes - State Compulsory Module	0	2	1	3	15	0	2	1		3
4	Mathematical analysis -I *Compulsory Professional Module* 5	2	2	0	4	15	6	2			7
5	Linear Algebra and analytical geometry 1- *Compulsory Professional Modules4*	2	1	0	3	15	6	1			5
6	Information Technology-STEM	1	1	1	3	15	3	1	1		3
											24
	2nd Semester										
a/	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in week	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Engineering and computer graphics - STEM	1	0	2	3	15	2	2			4
2	Mathematical analysis -II - *Compulsory Professional Modules 6*	2	2	0	4	15	6	2			7

3	Mathematical logic - *Compulsory Professional Modules*	2	1	0	3	15	6	1			5
4	Programming - *Basic Professional Modules*	1	0	2	3	15	3	0	2		5
5	Linear Algebra and analytical geometry 2- *Compulsory Profession-*	2	1	0	3	15	6	1			5
6	Physics-STEM	2	1	0	3	15	6	1			5
											31
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercise	Laboratory	Total	Total in	Theory	Practice - Exercise	Laboratory	Total	ECTS
1	Computing Methods*Compulsory Pro-*	2	0	1	3	15	6	0	1		5
2	Functions of Several	2	2	0	4	15	6	2			7
3	Algebra -1 - *Compulsory*	2	1	0	3	15	6	1			5
4	Probability Theory and Mathematical statistics- *Compulsory Professional Modules*	2	1	0	3	15	6	1			5
5	Differential equations-	2	1	0	3	15	4	1			5
6	The theory of functions of a complex variable- *Compulsory Profession-*	2	1	0	3	15	6	1			5
											32
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercise	Laboratory	Total	Total in	Theory	Practice - Exercise	Laboratory	Total	ECTS
1	Philosophy of Scientific Knowledge - State Compulsory	1	1	0	2	15	2	1			2
2	Multivariate analysis and the theory of the field *Compulsory*	2	1	0	3	15	6	1	0		5
3	Algebra-2- *Compulsory Profes*	2	1	1	3	15	6	1			5

4	Differential geometry-*Compulsory Professional Modules*	2	1	0	3	15	6	1			5
	The theory of algorithms-*Compulsory Profes-*	2	1	0	3	15	6	1			5
5	Differential equations and the theory of stability-*Compulsory*	2	1	0	3	15	6	1			5
6	Manufacturing Prac-	1					2				2
7	Scientific writing	1									2
											31
5th Semester											
a/a	Courses	Teaching hours					Workload				
		Theo-ry	Practice -Exercise	Laborato-ry	To-tal	Total in	Theo-ry	Practice -Exercise	Laborato-ry	To-tal	ECTS
1	Basics of nanotech-nology- STEM	1	1	0	3	15	2	1			3
	Psychology of Inter-personal Communica-tion - *Social and Communicative Mod-*	1	1	0	3	15	2	1			3
3	Functional Analysis - *Compulsory Professional Modules*	2	1	0	3	15	6	1			5
	Mathematical model-sof theoretical phys-	2	1	0	3	15	6	1			5
	Mathematical prob-lemsof population	2	1	0	3	15	6	1			5
4	Integrals depending on parameters **or** Elements of the theory of computation **or**StochasticFinancial Mathematics	2	1	0	3	15	6	1			4
5	Functional spaces and embedding theorems **or** Elements of the theory of computation	2	1	0	3	15	6	1			5
											30
6th Semester											
a/a	Courses	Teaching hours					Workload				
		Theo-ry	Practice -Exercise	Laborato-ry	To-tal	Total in	Theo-ry	Practice -Exercise	Laborato-ry	To-tal	ECTS

1	Partial Differential equations - *Compulsory Professional Modules*	2	1	0	3	15	6	1			5
2	Functional spacesand embedding theorems **or** Algebraic Systems **or** Mathematical Sta-	1	1	0	2	15	3	1			4
3	Practicumon Mathematical Analysis **or** Fundamentals of Group Theory **or**Stochastic Analysis	1	1	0	2	15	2	1			3
4	Practicum on Functional Analysis **or** The theory of algorithms **or**Applied Statisticsand Econometrics	2	1	0	3	15	6	1			4
5	The use ofthe Maple-computerfor analysis **or** Introduction to models**or** The theory of stochasticprocesses	2	1	0	3	15	6	1			4
6	Entire functions and their applications **or**Rings and fields**or** Limit theorems of	2	1	0	3	15	6	1			4
7											
8	Scientific writing		1	0	1						2
9	Manufacturing Practicum II										2
											28
7th Semester											
a/a	Courses	Teaching hours					Workload				
		Theo-	Practice -	Laborato-	To-	Total	Theo-	Practice -	Laborato-	To-	ECTS
1	General Topology- *Compulsory Professional Modules*	2	1	0	3	15	6	1			5
2	The calculus of variations and optimization techniques*Compulsory Professional*	2	1	0	3	15	6	1			5
3	Theoretical Mechanics*Compulsory Professional Modules*	2	1	0	3	15	6	1			5
4	Linear differentialoperators **or** Effective computability**or**	2	1	0	3	15	6	1			4

5	Spectral theoryof linear operators **or** computable ordinals**or** Stochastic	2	1	0	3	15	6	1			4
6	Generalized function-sand their applica-tions**or** Complete theories**or** Markov	2	1	0	3	15	6	1			4
7	Extreme problems inapproximation theory **or**Lie algebra **or**Mathematicsrisk insurance	2	1	0	3	15	6	1			4
											31
8thSemester											

a/a	Internships	Allocated hours	ECTS Workload
2	Industry Internship	240 hours	8
3	Pre-diploma Research Internship	210 hours	7
	Preparation and Pres-entation of Bachelor's Dissertation (Diploma Project)	360 hours	12
			27
	Overall internship workload		

a/a	Internship	Allocated hours	ECTS Workload
1	Educational Practice	60 hours	2
2	Industry Internship	450 hours	15
3	Pre-diploma Research	210 hours	7
4	Preparation and Pres-entation of Bachelor's	360 hours	12

											204/36
5	Additional type of practice:										
	Manufacturing Prac-tice -III										3

For the Bachelor programme Physics:

1st Semester											
a/	Courses	**Teaching hours**					**Workload**				
		Theo-ry	Practice - Exercises	Laborato-ry	To-tal	Total in week	Theo-ry	Practice - Exercises	Laborato-ry	To-tal	ECTS
	Core courses										
1	History of Kazakhstan (State Examination) - State Compulsory Mod-	2	1	0	3	15	2	1	0	3	**3**
2	Kazakh(Russian) Language for Profes-sional Purposes - State Compulsory	0	3	0	3	15	0	3	0	3	**3**
3	Foreign Language for Professional Pur-poses - State Compulsory Module	0	2	1	3	15	0	2	1	3	**3**
4	Calculus 1 - *STEM Module – Module 1*	2	1	0	3	15	4	1	0	5	**5**
5	Analytic Geometry and Linear Algebra - *STEM Module – Module 3*	1	2	0	3	15	2	2	0	4	**4**
6	Classical Mechanics - *Compulsory Pro-fessional Modules - Module 4*	2	1	0	3	15	6	1	0	7	**7**
7	Physics Laboratory I (Mechanics) - *Compulsory Professional Modules -*	0	0	2	2	15	0	0	2	2	**2**
											27
	2nd Semester										
a/	Courses	Teaching hours					Workload				
		Theo-ry	Practice - Exercise	Laborato-ry	To-tal	Total in week	Theo-ry	Practice - Exercise	Laborato-ry	To-tal	ECTS
1	Calculus 2 - *STEM Module – Module 1*	2	1	0	3	15	4	1	0	5	**5**
2	Computing Language C++ - *STEM Mod-ule – Module 2*	1	0	2	3	15	2	0	2	4	**4**
3	Molecular Physics - *Compulsory Profes-*	2	1	0	3	15	6	1	0	7	**7**
4	Physics Laboratory II (Molecular Phys-	0	0	2	2	15	0	0	2	2	**2**
5	Pedagogy - *Compulsory Professional*	1	1	0	2	15	3	1	0	4	**4**
6	Psychology - *Compulsory Professional*	1	1	0	2	15	3	1	0	4	**4**
7	Educational practice - Freshman Seminar	60 hours					1				**3**
										Study courses:	
										Including practice: **29**	
		Total for the 1st year of study:									**56**
	3rd Semester										
a/	Courses	Teaching hours					Workload				

		Theo-ry	Practice - Exercise	Laborato-ry	To-tal	Total in ,	Theo-ry	Practice - Exercise	Laborato-ry	To-tal	ECTS
1	Computing of Physical Processes - *STEM Module – Module 2*	1	0	2	3	15	2	0	2	4	**4**
2	Differential and Integral Equations - *STEM Module – Module 3*	2	1	0	3	15	4	1	0	5	**5**
3	Electromagnetism - *Compulsory Professional Modules - Module 6*	2	1	0	3	15	6	1	0	7	**7**
4	Physics Laboratory III (Electromagnetism) - *Compulsory Professional Mod-*	0	0	2	2	15	0	0	2	2	**2**
5	Methods of Theoretical Physics. Part1. Fundamentals of Vector and Tensor Calculus - *Compulsory Professional*	1	2	0	3	15	3	2	0	5	**5**
6	*Only 2 of the following 9 disciplines are taken with 6 ECTS*										**6**
	Psychology of Interpersonal Communication - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Theoretical and Applied Political Science - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Ethics of Personal and Social Success - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Culture and Religion - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	General and Applied Sociology - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Human Life Safety - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Ecology and Sustainable Development - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Kazakhstan Law - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
	Fundamentals of Economics - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	*3*
											29
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theo-ry	Practice - Exercises	Laborato-ry	To-tal	Total in week	Theo-ry	Practice - Exercises	Laborato-ry	To-tal	ECTS
1	Philosophy of Scientific Knowledge - *State Compulsory Module*	1	1	0	2	15	1	1	0	2	**2**
2	Complex Variable Calculus - *STEM Module – Module 3*	1	2	0	3	15	2	2	0	4	**4**
3	Optics - *Compulsory Professional Modules - Module 7*	1	1	0	2	15	3	1	0	4	**4**

4	Physics Laboratory IV (Optics) *Compulsory Professional Modules -*	0	0	2	2	15	0	0	2	2	**2**
5	Fundamentals of Astrophysics - *Compulsory Professional Modules -*	1	2	0	3	15	3	2	0	5	**5**
6	Methods of Theoretical Physics. Part 2. Methods of Mathematical Physics - *Compulsory Professional Modules - Module 11*	1	2	0	3	15	3	2	0	5	**5**
7	Theoretical Physics. Part 1. Classical Mechanics - *Compulsory Professional Modules - Module 12*	1	2	0	3	15	3	2	0	5	**5**
8	Sophomore Seminar – Industry practice	150 hours									**5**
										Study courses:	
										Including practice:	
		Total for the 2nd year of study:									**61**
5th Semester											
a/a	Courses	Teaching hours					Workload				
		Theo-ry	Practice - Exercises	Laborato-ry	To-tal	Total in week	Theo-ry	Practice - Exercises	Laborato-ry	To-tal	ECTS
1	Fundamentals of Radio Physics and Electronics - *Compulsory Professional Modules - Module 8*	1	0	2	3	15	3	0	2	5	**5**
2	Atomic Physics - *Compulsory Professional Modules - Module 9*	1	2	0	3	15	3	2	0	5	**5**
3	Physics Laboratory V (Atomic Physics) - *Compulsory Professional Modules - Module 9*	0	0	2	2	15	0	0	2		**2**
4	Theoretical Physics. Part 2. Electrodynamics - *Compulsory Professional Modules - Module 12*	1	2	0	3	15	3	2	0	5	**5**
5	Methodology of Physics Teaching - - *Compulsory Professional Modules - Module 14*	1	2	0	3	15	3	2	0	5	**5**
6	Advanced Mathematical Physics – Technical Thermodynamics – Elective Introduction to Plasma Physics – Elective Professional Modules – Module 1	1	1	0	2	15	3	1	0		**4**
7	Numerical Methods in Theoretical Thermal Physics Gas discharge Physics	1	1	1	3	15	3	1	1	5	**5**
											31
6th Semester											
a/a	Courses	Teaching hours					Workload				

		Theo-ry	Practice - Exercises	Laborato-ry	To-tal	Total in week	Theo-ry	Practice - Exercises	Laborato-ry	To-tal	ECTS
1	Nuclear Physics - *Compulsory Professional Modules - Module 10*	1	2	0	3	15	3	2	0	5	**5**
2	Physics Laboratory VI (Nuclear Physics) - *Compulsory Professional Modules - Module 10*	0	0	2	2	15	0	0	2	2	**2**
3	Theoretical Physics. Part 3. Quantum Mechanics - *Compulsory Professional Modules - Module 13*	1	2	0	3	15	3	2	0	5	**5**
4	*One of the following 3 modules is taken with total 6 ECTS*										**6**
	Biological Physics - *Interdisciplinary module - Module 15*	0	2	0	2	15	0	2	0	2	*3*
	Foreign language. Scientific and Technical Translation - *Interdisciplinary module - Module 15*	0	2	0	2	15	0	2	0	2	*3*
	Intellectual Property Law - *Interdisciplinary module - Module 16*	0	2	0	2	15	0	2	0	2	*3*
	Physics for Future Leaders - *Interdisciplinary module - Module 16*	0	2	0	2	15	0	2	0	2	*3*
	CultureofSpeechandLanguageCommunication- *Interdisciplinary module - Module 17*	0	2	0	2	15	0	2	0	2	*3*
	Al-Farabi and Contemporaneity - *Interdisciplinary module - Module 17*	0	2	0	2	15	0	2	0	2	*3*
3		1	2	0	3	15	3	2	0	5	**5**
4	Applied Thermal Physics Vacuum Technique and Plasma Diag-	1	2	0	3	15	3	2	0	5	**5**
5		1	2	0	3	15	3	2	0	5	**5**
6	Industry Practice - Frontiers in Phys-	150 hours									**5**
										Study courses:	
										Including practice:	
		Total for the 3rd year of study:									**69**
7th Semester											
a/a	Courses	Teaching hours					Workload				

		Theo-ry	Practice - Exercises	Laborato-ry	To-tal	Total in weeks	Theo-ry	Practice - Exercises	Laborato-ry	To-tal	ECTS
1	Theoretical Physics. Part 4. Thermodynamics and Statistical Physics- *Compulsory Professional Modules - Module 13*	1	2	0	3	15	3	2	0	5	**5**
2	Scientific writing – Elective Professional Modules – *Module 1*	0	1	0	1	15	0	1	0	1	**1**
3	Relativistic Quantum Theory- Elective Professional Modules – Module 3 Physics of Combustion and Explosion - Elective Professional Modules – Mod- Computer Simulation in Plasma Physics - Elective Professional Modules – Module 3	1	2	0	3	15	3	2	0	5	**5**
4	Introduction to the Theory of Nucleus - Elective Professional Modules – Module 4 Numerical Methods - Elective Professional Modules – Module 4 Ionosphere and Space Plasma - Elec-	1	2	0	3	15	3	2	0	5	**5**
5	Approximate Methods of Quantum Mechanics - Elective Professional System Modeling and Simulation - Elective Professional Modules – Module 5 Basis of Plasma Electrodynamics -	1	2	0	3	15	3	2	0	5	**5**
6	General Relativity - Elective Professional Modules – Module 5 Plant and Power Application - Elective Professional Modules – Module 5 Fusion Energy - Elective Professional	1	2	0	3	15	3	2	0	5	**5**
7	Numerical Methods in General Relativity - Elective Professional Modules – Module 5 Fundamentals of Environmental Engineering - Elective Professional Mod- Physics of Dusty Plasma - Elective	1	1	1	3	15	3	1	1	5	**5**
											31
8th Semester											

a/a	Internships	Allocated hours	ECTS Workload
1	Pedagogical Practice (4)	120 hours	4
2	Industry practice - Honors Frontiers in Physics	150 hours	5
3	Pre-diploma Research Internship - Thesis Research I	150 hours	7
4	Preparation and Presentation of Bachelor's Dissertation (Diploma Project) - Thesis Research II (Final Attestation)	210 hours	7
			23
			Total for the 4th year of study: 52
	Overall internship workload		
a/a	Internship	Allocated hours	ECTS Workload
1	Educational Practice	60 hours	3
2	Pedagogical Practice (4)	120 hours	4
3	Industry Internship	450 hours	15
4	Pre-diploma Research Internship - Thesis Research I (2)	150 hours	7
5	Preparation and Presentation of Bachelor's Dissertation (Diploma Project) - Thesis Research II (Final Attestation)	210 hours	7
			36 ECTS
			204/36 Total: 240 / including practice: 36 Theoretical education: 204 ECTS / Practice: 36 ECTS
5	Additional type of practice: Sport and Physical training	4 ECTS	

For the Bachelor programme Physics pedagogic:

1st Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercis	Labora-tory	Total	Totalin weeks	Theory	Practice - Exercises	Laborato-ry	Total	ECTS
1	History of Kazakhstan (State Examination) - *State Compulsory Module*	2	1	0	3	15	4	1	0	5	5
2	Professionally-Oriented Kazakh (Russian) Language- *State Compulsory Module*	0	3	0	3	15	0	3	0	3	3
3	Professionally-Oriented Foreign Language- *State Compulsory Module*	0	2	1	3	15	0	2	1	3	3
4	Calculus 1- *STEM module- Module* 1	1	2	0	3	15	2	2	0	4	4
5	Classical Mechanics- *Compulsory professional modules- Module 4*	1	2	0	3	15	3	2	0	5	5

6	Physics Laboratory I (Mechanics)- *Compulsory professional modules - Module 4*	0	0	2	2	15	0	0	2	2	2
											22
	2nd Semester										
a/a	Courses	Teachinghours					Workload				
		Theory	Practice -	Labora-tory	Total	Totalin weeks	Theory	Practice - Exercises	Laborato-ry	Total	ECTS
1	Calculus 2- *STEM module - Module* 1	1	2	0	3	15	2	2	0	4	4
2	Computing Language C++ - *STEM module- Module 2*	1	0	2	3	15	2	0	2	4	4
3	Analytic Geometry and Linear Algebra - *STEM module- Module 3*	1	2	0	3	15	2	2	0	4	4
4	Molecular Physics- *Compulsory professional modules- Module 5*	1	2	0	3	15	3	2	0	5	5
5	Physics Laboratory II (Molecular Physics)- *Compulsory professional modules- Module 5*	0	0	2	2	15	0	0	2	2	2
6	Pedagogy- *Compulsory professional modules- Module 12*	1	2	0	3	15	3	2	0	5	5
7	Psychology- *Compulsory professional modules- Module 13*	1	1	0	2	15	3	1	0	4	4
	Educational practice	4					2				2
											30
3rd Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice -	Labora-tory	Total	Totalin	Theory	Practice - Exercises	Laborato-ry	Total	ECTS
1	Psychology of InterpersonalCommunication - *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	3
	Theoretical and Applied Political Science- *Social and Communicative Module*										
	Ethics of Personal and Social Success- *Social and Communicative Module*										
	CultureandReligion - *Social and Communicative Module*										
	General and Applied Sociology- *Social and Communicative Module*										
2	Human Life Safety- *Social and Communicative Module*	1	1	0	2	15	2	1	0	3	3
	Ecology and Sustainable Development - *Social and Communicative Module*										
	Kazakhstan Law- *Social and Communicative Module*										
	Fundamentals of Economics- *Social and Communicative Module*										
3	Computing of Physical Processes – *STEM module– Module 2*	1	0	2	3	15	2	0	2	4	4
4	Differential and Integral Equations – *STEM module- Module 3*	1	2	0	3	15	2	2	0	4	4
5	Electromagnetism– *Compulsory professional modules - Module 6*	1	2	0	3	15	3	2	0	5	5
6	Physics Laboratory III (Electromagnetism) – *Compulsory professional modules - Module 6*	0	0	2	2	15	0	0	2	2	2

7	Methods of Theoretical Physics. Part1. Fundamentals of Vector and Tensor Calculus– *Compulsory professional modules- Module 9*	1	2	0	3	15	3	2	0	5	5
											26
4th Semester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice -	Laboratory	Total	Totalin hours	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Philosophyof Scientific Knowledge–*State Compulsory Module*	1	1	0	2	15	3	1	0	4	4
2	Probability Theory and Mathematical Statistics – *STEM module- Module 3*	2	1	0	3	15	4	1	0	5	5
3	Optics – *Compulsory professional modules- Module 7*	1	1	1	3	15	3	1	1	5	5
4	Fundamentals of Astronomy– *Compulsory professional modules- Module 7*	1	2	0	3	15	3	2	0	5	5
5	Methods of Theoretical Physics. Part 2. Methods of Mathematical Physics – *Compulsory professional modules- Module 9*	1	2	0	3	15	3	2	0	5	5
6	Theoretical Physics. Part 1. Classical Mechanics– *Compulsory professional modules - Module 10*	1	2	0	3	15	3	2	0	5	5
	Practice Training	60 hours					2				2
											31
5thSemester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice -	Laboratory	Total	Totalin hours	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Atomic Physics –*Compulsory professional modules -Module 8*	1	1	1	3	15	3	1	1	5	5
2	Theoretical Physics. Part 2. Electrodynamics– *Compulsory professional modules –Module 10*	1	2	0	3	15	3	2	0	5	5
3	Ethno pedagogics–*Compulsory professional modules –Module 12*	1	1	0	2	15	3	1	0	4	4
4	Methodology of Physics Teaching–*Compulsory professional modules - Module 14*	1	2	0	3	15	3	2	0	5	5
5	Information systems in Science and Education– *Compulsory professional modules- Module 14*	1	1	1	3	15	3	1	1	5	5
6	Advanced Mathematical Physics - *Elective Professional Modules- Module 1. Advanced Mathematical and Theoretical Physics and Scientific Writing* Technical Thermodynamics - *Elective Professional Modules- Module 1. Introduction to Thermal Physics and Scientific Writing* Physics of Elementary Processes in Plasma - *Elective Professional Modules-Module 1. Plasma Physics and Scientific Writing*	1	1	0	2	15	3	1	0	4	4
7	Numerical Methods in Theoretical Physics - *Elective Professional Modules-Module 2. Special Relativity and Numerical Methods* Thermal Physics - *Elective Professional Modules-Module 2. Thermal Physics* Introduction to Plasma Physics - *Elective Professional Modules-Module 1. Plasma Physics and Scientific Writing*	1	1	1	3	15	3	1	1	5	5

											33
6thSemester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercis	Laboratory	Total	Totalin weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Nuclear Physics – *Compulsory professional modules – Module 8*	1	1	1	3	15	3	1	1	5	5
2	Theoretical Physics. Part 3. Quantum Mechanics– *Compulsory professional modules – Module 11*	1	2	0	3	15	3	2	0	5	5
3	Self-cognition– *Compulsory professional modules – Module 13*	1	1	0	2	15	3	1	0	4	4
4	Foreign language. Scientific and Technical Translation– *Compulsory professional modules- Module 15*	0	2	0	2	15	0	2	0	2	2
	Intellectual Property Law– *Compulsory professional modules- Module 16*										
	Physics for Future Leaders– *Compulsory professional modules - Module 16*										
	CultureofSpeechandLanguageCommunication– *V Compulsory professional modules - Module 17*										
5	Biological Physics– *Compulsory professional modules - Module 15*	1	1	0	2	15	3	1	0	4	4
	Al-Farabi and Contemporaneity – *Compulsory professional modules- Module 17*										
6	Advanced Theoretical Physics - *Elective Professional Modules -Module 1. Advanced Mathematical and Theoretical Physics and Scientific Writing*	1	2	0	3	15	3	2	0	5	5
	Introduction to Thermal Physics - *Elective Professional Modules - Module 1. Introduction to Thermal Physics and Scientific Writing*										
	Gas discharge Physics- *Elective Professional Modules - Module 2. Gas Discharge Physics*										
7	Special Relativity - *Elective Professional Modules - Module 2. Special Relativity and Numerical Methods*	1	2	0	3	15	3	2	0	5	5
	Applied Thermal Physics - *Elective Professional Modules - Module 2. Thermal Physics*										
	Computer Simulation in Plasma Physics- *Elective Professional Modules - Module 3. Computer Simulation in Plasma Physics*										
8	Classical Fields Theory- *Elective Professional Modules - Module 3. Classical Fields and Relativistic Theory*	1	2	0	3	15	3	2	0	5	5
	Heat Transfer- *Elective Professional Modules - Module 3. Processes in Thermal Physics*										
	Numerical Methods in Plasma Physics- *Elective Professional Modules - Module 3. Computer Simulation in Plasma Physics*										
	Practice Training	150 hours					5				5
											40
7thSemester											
a/a	Courses	Teachinghours					Workload				
		Theory	Practice - Exercis	Laboratory	Total	Totalin weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS

1	Modern Physics– *Compulsory professional modules – Module 11*	1	2	0	3	15	3	2	0	5	5
2	Scientific writing -*Elective Professional Modules - Module 1. Advanced Mathematical and Theoretical Physics and Scientific Writing*	0	1	0	1	15	0	1	0	1	1
	Scientific writing- *Elective Professional Modules Module 1. Introduction to Thermal Physics and*										
	Scientific writing *Elective Professional Modules - Module 1. Plasma Physics and Scientific Writing*										
3	Relativistic Quantum Theory- *Elective Professional Modules - Module 3. Classical Fields and Relativistic Theory*	1	2	0	3	15	3	2	0	5	5
	Physics of Combustion and Explosion - *Elective Professional Modules - Module 3. Processes in Thermal Physics*										
	Vacuum Technique and Plasma Diagnostics Basics- *Elective Professional Modules - Module 2. Gas Discharge Physics*										
4	General Relativity - *Elective Professional Modules - Module 4. General Relativity and Numerical Methods*	1	2	0	3	15	3	2	0	5	5
	Numerical Methods - *Elective Professional Modules - Module 4. Methods of Thermal Physics*										
	Ionosphere and Space Plasma- *Elective Professional Modules - Module 4. Properties of Plasma in Laboratory and Nature*										
5	Numerical Methods in General Relativity- *Elective Professional Modules - Module 4. General Relativity and Numerical Methods*	1	2	0	3	15	3	2	0	5	5
	System Modeling and Simulation- *Elective Professional Modules - Module 4. Methods of Thermal Physics*										
	Basis of Plasma Electrodynamics- *Elective Professional Modules - Module 4. Properties of Plasma in Laboratory and Nature*										
6	Age Physiology and School Hygiene- *Elective Professional Modules - Module 5. Computer Models in School Course Physics*	1	2	0	3	15	3	2	0	5	5
	Theory and Methods of Educational Works- *Elective Professional Modules - Module 5. Methods of Educational and Experimental Works*										
	Innovation Methods of Educational Works- *Elective Professional Modules - Module 5. Innovation Methods of Educational Works*										
7	Computer Technologies in Physical Science and Education- *Elective Professional Modules - Module 5. Computer Models in School Course Physics*	1	1	1	3	15	3	1	1	5	5
	Methods of Physical Experiments in School l- *Elective Professional Modules - Module 5. Methods of Educational and Experimental Works*										
	Computer Technologies for Study of Physics- *Elective Professional Modules - Module 5. Innovation Methods of Educational Works*										
											31
8thSemester											
a/a	Internships	Allocatedhours					ECTS Workload				

2	Industry Internship	240 hours	8
3	Pre-diploma Research Internship	210 hours	7
	Preparation and Presentation ofBachelor's Dissertation (Diploma Project)	360 hours	12
			27
	Overall internship workload		
a/a	Internship	Allocatedhours	ECTS Workload
1	Educational Practice - Учебная практика	60 hours	2
2	Industry Internship	450 hours	15
3	Pre-diploma Research Internship	210 hours	7
4	Preparation and Presentation ofBachelor's Dissertation (Diploma Project)	360 hours	12
			36
			Total 204/36

For the Master programme Mathematics:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Core courses										
1	History and Philosophy of Science (in English language) – Compulsary State	1	1	0	2		1	1			2
2	Foreign language (Professional) (in English language) - Compulsary State	1	1	0			1	1			2
3	Organization and planning of scientific research (in English language) – Compulsory Professional Module 1	2	1	0			6	1			7
4	Methods of Teaching Higher Education Mathematics (in English language) - Compulsory Professional Module 2	2	1	0			6	1			7
5	Mathematical analysis on metric spaces and stochastic analysis (in English language) - Compulsory Professional Mod-	1	1	0			3	1			4
6	Algebraic structures (in English language) – Specialization Disciplines	2	1	0			6	1			7
7	Research Seminar I	120 hours				3					3
											32
	2nd Semester										

a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Pedagogics (in English language) - Compulsary State Modules	1	1	0			1	1			2
2	Psychology (in English language) – Compulsary State Modules	0	2	0			0	2			2
3	Mathematical analysis on Manifolds	2	1	0			6	1			7
4	Qualitative theory of differential equationsor Constructive theory of boundary value optimal or Multidimensional Complex Analysis control problems or Theory of time series and forecasting or Mathematical Foundations of Probability	1	1	0			3	1			4
5	Dynamical systems theory or Inverse problems for stochastic differential equations or Number-theoretic methods in approximate analysis and their applications or Nonparametric regression or Sums of independent random variables or	1	1	0			3	1			4
6	Boundary-value problems for ordinary differential equations or Methods for solving boundary value problems or Approximations for functions of several variables or Martingales and their applications in finance or Theory of statistical	1	1	0			3	1			4
7	Boundary-value problems for partial differential equations or Generalized Functions and its Applications or Application of approximate calculations to the problems about eigenvalues or Distributions theory and their application in insurance or Applied Statistics and Eco	1	1	0			3	1			4
8	Research Internship 1	60 hours				2					2
9	Research Seminar II	120 hours				3					3
											32
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Inverse problems of mathematical physicsor Stability theory for dynamical systems or Nikolsky-Besov spaces and their applications to boundary value problems for generalized analytic functions or Pension plans or Stochastic	2	1	0			6	1			7
2	Additional chapters on differential equations and mathematical physics or Theory of phase systems or Boundary value problems and their spectral properties for equations of mixed parabolic-hyperbolic type or Reliability theory and its application in insurance or Diffusion Processes and Their Applications or	2	1	0			6	1			7

3	Singularly perturbed integro-differential equationsor Boundary value optimal control problems or Theory of identification of the boundary conditions and its applications or Methods for calculating the allowance for losses or Introduction to the theory of martingales or Algebraic	2	1	0			6	1			7
4	Navier–Stokes equations or Differential games or A nonlinear boundary value problem for an ordinarydifferential equation or Theory of investment or Statistics of Random Processes or Mod-	2	1	0			6	1			7
											28
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	360 hours					3				
2	Pedagogic internship	210 hours					7				
3	Research Seminars	270 hours					9				
4	Thesis Writing and Defense	180 hours					6				
5	Complex Exam	120 hours					4				
							28				28
	Overall internship workload										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	150 hours					5				
2	Pedagogic internship	210 hours					7				
3	Research Seminars	420 hours					14				
4	Thesis Writing and Defense	180 hours					6				
5	Complex Exam	120 hours					4				
											36
											84/36

For the Master programme Physics:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in weeks	Theory	Practice - Exercises	Laboratory	Total	ECTS

	Core courses										
1	History and Philosophy of Science - State compulsory module 1	1	1	0	2	15	2	1	0	3	**3**
2	Foreign Language (professional) – State compulsory module 1	0	2	0	2	15	0	2	0	2	**2**
3	Scientific Research Organization and Planning (in English language) –	2	1	0	3	15	6	1	0	7	**7**
4	Quantum Field Theory– Core Professional Module 2	2	1	0	3	15	6	1	0	7	**7**
5	Additional Topics of General Relativity – Elective module 1 Thermodynamics and Heat Transfer – Elective module 1 Selected topics of plasma physics – Elective module 1	2	1	0	3	15	6	1	0	7	**7**
6	Quantum Theory of Many-Body – Elective module 1 Refrigeration – Elective module 1 Physics of plasma – Elective module 1	1	1	0	2	15	3	1	0	4	**4**
7	Research Seminar I (Master's Research Work)	90 hours									**3**
									Courses: 30		
									Total for the 1st semester: 33		
	2nd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Pedagogics - State compulsory	1	1	0	2	15	2	1	0	3	**3**
2	Psychology - State compulsory	1	1	0	2	15	2	1	0	3	**3**
3	Basic Principles of Modern Physics –	1	1	0	2	15	3	1	0	4	**4**
4	Computer Modeling of Multiparticle Systems – Core Professional Module 3	1	1	0	3	15	3	1	0	5	**4**
5	Experimental Physics – Core Professional Module 3	2	1	0	3	15	6	1	0	7	**7**
6	The Problem of Bodies Motion in General Relativity– Elective module 1 Fuel and its use – Elective module 1 Nonlinear phenomena in	2	1	0	3	15	6	1	0	7	**7**

7	Quantum Theory of Scattering – Elective module 2 Modelling and optimisation of energy processes – Elective mod- Electrodynamic processes in dense plasma – Elective module 2	1	1	0	2	15	3	1	0	4	**4**
8	Research Internship 1	60 hours				2					**2**
9	Research Seminar II	120 hours				3					**3**
									Courses:		
								Total for the 2nd semester:			
									Total for the 1st year:		
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Introduction to the Supersymmetry Theory– Elective module 3 Computational Methods inThermal Physics– Elective module 3 Computer simulation in physics of dense plasma– Elective module 3	2	1	0	3	15	6	1	0	7	**7**
2	Relativistic Astrophysics– Elective module 3 Computer technologies of the solution ofengineering tasks– Collision processes in dense plas-ma– Elective module 3	1	1	0	2	15	3	1	0	4	**4**
3	Numerical Methods of Theoretical Physics– Elective module 4 **Understanding Sustainable Energy Production and Use**– Physics of gas discharged processes // Introduction to gas discharge plasma physics– Elec-	2	1	0	3	15	6	1	0	7	**7**
4	Nuclear Astrophysics– Elective module 4 Wind power– Elective module 4 Impulse plasma dynamics– Elective module 4	1	1	0	2	15	3	1	0	4	**4**
	Pedagogicalpractice	210 hours									**7**

	Research Seminar III (Master's Research Work)	120 hours									**3**
									Courses: 22		
								Total for the 3rd semester: 32			
4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship 2	90 hours					2				**3**
2	Research Seminar IV (Master's Research Work)	150 hours					5				**5**
3	Complex Examination (Complex Exam)	120 hours					4				**4**
4	Completion and Defense of Dissertation	180 hours					6				**6**
									Total for the 4th semester: 18		
									Total for the 2nd year: 50		
	Overall internship workload										
a/a	Courses	Teaching hours		Workload							
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research Internship	150 hours					5				
2	Pedagogic internship	210 hours					7				
3	Research Seminars	420 hours					14				
4	Thesis Writing and Defense	180 hours					6				
5	Complex Exam	120 hours					4				
Total 120 ECTS / including practice 36 ECTS											

For the Master programme Physics pedagogic:

1st Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
	Core courses										
1	History and Philosophy of Science- *State Compulsory Mod-*	1	1	0	2	15	1	1	0		2

2	Foreign language (Professional)- *State Compulsory Module*	0	3	0	3	15	0	3	0		3
3	Organization and Planning of Scientific Research - *Compulsory*	1	2	0	3	15	3	2	0		5
4	Methods of Solving Problems in Physics - *Compulsory profession-*	2	1	0	3	15	6	1	0		7
5	Modern Teaching Methods in High Education Schools - *Com-*	1	2	0	3	15	3	2	0		5
6	Actual Problems of Modern Physics - *Compulsory*	1	1	0	2	15	3	2	0		5
	Research Seminar I	120 hours				3					1
											27
	2nd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Pedagogics - *State Compulsory*	1	1	0	2	15	1	1	0		2
2	Psychology- *State Compulsory*	1	1	0	2	15	1	1	0		2
3	Computer Technologies in Physi-cal Science and Education -	1	1	0	2	15	3	1	0		4
4	Additional Chaptersof Plasma Physics -*Individual Educational Path 1 Plasma physics in educa-* / Plasma Technologies - *Individual Educational Path 2 Main physical*	2	1	0	3	15	6	1	0		7
5	Gas Discharged Processes - *Individual Educational Path 1* / Methods of Computer Simulation of Physical Processes - *Individual Educational Path 2 Main physical*	2	1	0	3	15	6	1	0		7
6	Selected Topics of Courses «Me-chanics» and «Molecular phys-ics»- *Individual Educational Path* / Technics of Plasma Experiments- *Individual Educational Path 2 Main physical courses in teaching*	2	1	0	3	15	6	1	0		7
7	Selected Topics of Courses «Elec-tricity and Magnetizm» and «Atomic physics»- *Individual Educational Path 1 Plasma* / Additional Topics of Dense Plasma Physics- *Individual Educational Path 2 Main physical*	2	1	0	3	15	6	1	0		7
	Research practice 1	60 hours				2					2
	ResearchSeminar II	120 hours				3					3
											36
	3rd Semester										
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS

1	Methodology of Physics Experiment in HES - *Individual Educational Path 1 Plasma* Nonlinear Effects in Plasma - *Individual Educational Path 2 Main physical courses in teaching*	2	1	0	3	15	6	1	0		7
2	Modern Educational Technologies for Study of Physics- *Individual Educational Path 1 Plasma* Impulsed Discharges-*Individual Educational Path 2 Main physical*	2	1	0	3	15	6	1	0		7
3	Information Technologies in Physics Teacher's Work by in HES- *Individual Educational Path* Quality Management System of Physical Education-*Individual Educational Path 2 Main physical*	2	1	0	3	15	6	1	0		7
4	Computer Methods in Plasma Physics- *Individual Educational Path 1 Plasma physics in educa-* Innovative Technologies in Study of Physics-*Individual Educational Path 2 Main physical courses in*	2	1	0	3	15	6	1	0		7
	Pedagogical Practice										
	Research Seminar III										
											28

4th Semester											
a/a	Courses	Teaching hours					Workload				
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research practice 2	120 hours					4				
2	Research Seminar IV	210 hours					7				
3	Complex Examination	120 hours					4				
4	Dissertation Preparationand Defence	180 hours					6				
							29				

	Overall internship workload										
a/a	Courses	Teaching hours		Workload							
		Theory	Practice - Exercises	Laboratory	Total	Total in	Theory	Practice - Exercises	Laboratory	Total	ECTS
1	Research practice 2	120 hours					4				
2	Research Seminar IV	210 hours					7				
3	Complex Examination	120 hours					4				
4	Dissertation Preparationand Defence	180 hours					6				
											84/36