ASIIN Certification Report

PhD Programmes
Material Science and New Material Technology
Nuclear Physics
Physics and Astronomy
Technical Physics
Physics

Provided by
Kazakh National University named after al-Farabi

Version: 11th November 2014

Table of Content

A About the Certification Process

Title of the PhD Programmes	Previous ASIIN certification
6D0701000 – Material science and new material technology	No
6D060500 – Nuclear Physics	No
6D061100 – Physics and Astronomy	No
6D072300 – Technical Physics	No
6D060400 – Physics	No
Date of the contract: 20.09.2013 **Submission of the final version of the self-assessment report:** 22.08.2014 **Date of the onsite visit:** 09.07.2014 **at: al-Farabi Kazakh National University, main campus, Physic-Technical Faculty**	
Peer panel: Prof. Dr.-Ing. Hans-Heinrich Gatzen, University of Hannover Prof. Dr. Ralf-Jürgen Dettmar, Ruhr-University Bochum Prof. Dr. Jürgen Schmelzer, Dresden University of Applied Sciences Prof. Dr. Herbert Müther, University of Tübingen Prof. Dr. Steffen Teichert, Jena University of Applied Science Prof. Dr. Frank Petzold, Fraunhofer IFAM in Bremen Asset Rakishev (Student representative), TU Karaganda	
Representative of the ASIIN headquarter Mila Zarkh, M.A.	
Responsible decision-making committee: Certification committee	
Criteria used: Standards for the Certification of (Further) Education and Training for courses and	

modules related to Computer Sciences, Technology, Natural Sciences and Business Economics as of 27.07.11. European Standards and Guidelines as of 2009 (3rd edition).

In order to facilitate the legibility of this document, only masculine noun forms will be used hereinafter. Any gender-specific terms used in this document apply to both women and men.

B Characteristics of the PhD Programmes

a) Name of the course	b) Degree awarded upon conclusion	c) Mode of Study	d) Duration & Credit Points	e) First time of offer & Intake rhythm	f) Number of students per intake	g) Fees
PhD programme 6D071000 – Material science and new material technology	PhD in Material science and new material technology	Full time	6 Semester/ 75 Kazakh Credit Points (112.5 ECTS)	Winter term 2011/2012, annual intake	Varies depending on state grants between 5 and 10	N/A
PhD programme 6D060500 – Nuclear Physics	PhD in Nuclear Physics	Full time	6 Semester/ 59 Kazakh credit points (177 ECTS)	Winter term 2009/2010, annual intake	Varies depending on state grants; between 2 and 3	N/A
PhD progarmme 6D061100 – Physics and Astronomy	PhD in Physics and Astronomy	Full time	6 Semester/ 75 Kazakh Credit Points (112.5 ECTS)	Winter term, no year indicated (no statistics provided)	Varies depending on state grants/ no information provided on intake	N/A
PhD Programme 6D072300 – Technical Physics	PhD (Philosophy Doctor)	Full time	6 Semester/ 75 Kazakh Credit Points (125 ECTS)	Winter term 2010/2011, annual intake	Varies depending on state grants between 1 and 6	N/A
PhD Programme 6D060400 – Physics	PhD in Physics	Full time	6 Semester/ 75 Kazakh Credit Points (185.5 ECTS)	Winter term 2007/2008, annual intake	Varies depending on state grants between 2 and 7	N/A

For the PhD Programme 6D071000 – Material science and new material technology, the self-assessment report states the following **intended learning outcomes**:

“I Knowledge

- Major trends and directions of development of modern theoretical and practical materials and modern production technologies and materials processing;
- About the specifics of the main content of specializations in the field of materials science and technology of new materials;
- About the major scientific and technical problems and prospects of the development of science and technology, the relevant specialized training, their relationship with adjacent areas;

- The main trends changes in operating conditions of equipment, which are used or could be used new materials;

- Trends to create a fundamentally new technological processes and materials processing;

- Complex modeling and design materials, processes and tooling equipment used for receiving and processing materials;

- Patterns of relationship performance materials with their composition, state, technological modes (for all operations of the process), the operating conditions;

- Methods to ensure environmental and safety processes of reception and processing of materials;

- The principles of coordination of production activities;

-Research methods of macro-, micro-and fine-structure materials, intermediate products and products (parts);

- Different types and nature of the forces due to crystals polyatomic molecules, amorphous materials, the structural formula and the addition circuit (system) determination of properties;

- Types of crystal resh "talk, their crystallographic characteristics, their impact on the manufacturability of the material;

- Methods for determining the parameters of crystal reshotok, crystallographic orientations and textures;

- Phase rule, thermodynamic bases for the construction of phase diagrams (analytical and experimental methods);

- The basis of the theory of electrolytes and high-molecular compounds, thermodynamics of electrode processes, methods for determining the coefficients of the thermodynamic quantities and the potential jumps at the interfaces (grain, interphase, interconnect);

- The basis of the theory of crystal defects, amorphous and high-molecular substances, the mechanisms of interaction of defects, fluctuations;

- The nature of the surface phenomena, the nature of the surface of the condensations, tension, wetting, adhesion, accounting methods of interaction of adsorbed atoms and molecules on surfaces;

II Understanding

- Select the appropriate materials for structural components and equipment with the requirements of efficiency, reliability and durability of products;

- Classify the existing types and grades of materials, their structure and properties in relation to the tasks with the use of databases and literature;

- Collect data on existing types and grades of materials;

- Analyze research on chemical and phase composition, structure and properties of materials

- Select the technological processes for the production and processing of materials;

- Find new advanced technologies for production and processing of materials, to introduce them into production;

- Select new materials (metal and non-metal, polymer and carbon materials, composites and hybrid materials, films and coatings, nano-materials, superhard materials) with predetermined technological and functional properties. For example, new energy sources, transforming the roof into the power plant, or optical fibers that cause the light to transmit information;

- Describe and do drawings of parts and structural components;
- Discuss the terms of reference for specific situations;
- Select the appropriate materials for structural components and equipment with the requirements of efficiency, reliability and durability of products;

III Application

-Typical and original methods of engineering calculation parameters tehnological processes (including the use of computers);

- Graphs, charts, nomograms, characterizing patterns of relationship between the structure and properties of materials, process parameters and the parameters of the equipment;
- Special materials and other information (including foreign language) to solve professional problems;
- The methods of quantitative structural analysis, control methods and tests, as well as related equipment, apparatus and instruments for quality control and process control;
- Knowledge of methods of modeling, simulation and experimental research to develop effective new materials and processes, as well as methods of data processing and error estimates of analytical calculations;
- Knowledge of construction methods and design to create a standard, non-standard and printsiialno new tooling;
- Knowledge of the laws of material science and technology for the production of materials, semi-products and products with desired properties and structural characteristics;
- Methods of prevention and elimination of defects in parts and semi-finished products;
- Methods and techniques for organizing labor, equipment, tooling, mechanization and automation to ensure the effective implementation of the production;
- Execution of charts, graphs, diagrams, charts, nomograms, and other professionally relevant images;
- Work with the technical documentation, technical literature, scientific and technical reports, manuals and other information sources;
- Programming of computer calculations of parameters and processes, use of computers for special tasks;
- Implementation of structural analysis, measurement, testing of materials and products;

engineering calculations on the basic types of professional tasks;

- Developing research plans, carry out technological experiments;
- The design process (overall and by stage) receipt and processing of materials;
- Design tooling;

IV Analysis

- Differentiate the improvement of technological processes of obtaining and processing of materials, participation in the work of the group of experts in carrying out the experiments and their results processed on the creation, research and selection of materials, the assessment of their technological and service quality through a comprehensive analysis of their structure and properties, physical, mechanical, corrosion and other tests;
- Analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment;
- Verify compliance with development projects and technical documentation of regulatory documents;
- Classify the existing types and grades of materials, their structure and properties in relation to the tasks with the use of databases and literature;
- Collect data on existing types and grades of materials;
- Analyze research on chemical and phase composition, structure and properties of materials;
- Distinguish methods of producing new materials.

V Synthesis

- Examine the professional literature and other scientific and technical information, the achievements of domestic and foreign science and technology in the field;
- Participate in the research, or performing technical developments;
- To carry out the collection, processing, analysis and systematization of scientific and technical information on the subject (target);
- Participate in the bench and industrial tests of prototypes (parties) designed products;
- Composes reports (sections of the report) on the topic or section (step, task)
- Be a speaker at the conference, and so on);
- Make a plan of the article, of course work;
- Write an article summary, a review of historical and theoretical plan;
- Write a term paper on an approved topic, speech on defense;
- Synthesize skills acquired in the course of research practice;
- Offer training plan;
- The statement of probation;
- Make a plan of the dissertation research;
- Make a plan on finding the bibliographic research;

VI Evaluation

- Demonstrate knowledge and understanding of the developmental obtained at the level of higher education, which are the basis for the original or the possibility of development or application of ideas, often in the context of scientific research;
- Apply knowledge, understanding and ability to solve problems in new or unfamiliar situations and contexts within broader (or multidisciplinary) areas related to the field of study;

- Integrate the knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge;

- Clearly communicate their conclusions and the knowledge and rationale to specialists and non-specialists;

- To continue learning on their own.

- Critically analyze existing concepts, theories and approaches to the study of the processes and phenomena;

- To integrate the knowledge gained in the different disciplines, to use them for analytical and administrative tasks in the new unfamiliar surroundings;

- Creative thinking and creative approach to solving new problems and situations;

- Conduct information analysis and information-bibliographic work using modern information technologies;

- Summarize the results of experimental research and analysis in the form of a thesis, article, report, analytical notes, etc."

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	Credit	**Unit**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (10 credits)	**7201**	Scientific Bases of the Development of New Materials	**3**	5/135	2+1+0	1
Elective Module of Professional Specialization 15 credits	**Optical and Radiation Effects in Materials**					
	RM 7301	Radiation Material Science	3	5/135	2+1+0	1
	OSM 7302	Optical Properties of Materials	3	5/135	2+1+0	1
	Physical and Technical Methods for Study of Materials					
	YaMR 7301	Nuclear Magnetic Resonance (NMR)	3	5/135	2+1+0	1
	EPR 7302	Electron Paramagnetic Resonance (EPR)	3	5/135	2+1+0	1
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					

	NIRD I	Research Seminar I	2	3/90		1
Semester 2						
Elective Module of Professional Specialization 15 credits	**Material Science**					
	FOPN 7303	Physical Basis of Nanomaterials Preparation	3	5/135	2+1+0	2
	TPPS 7304	Semiconductor Film Structures Technology	3	5/135	2+1+0	2
	MRFD 8305	Methods for Calculating Phase Diagrams	3	5/135	2+1+0	2
	Physical and Chemical Properties of Materials					
	FHSM 7303	Physico-Chemical Properties of Materials	3	5/135	2+1+0	2
	ESM 7304	The Electronic Properties of Materials	3	5/135	2+1+0	2
	MRFD 8305	Methods for Calculating Phase Diagrams	3	5/135	2+1+0	2
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					
	NIRD II	Research Seminar II	2(+1,5)	3/90		2
	Professional Practice					
	IP	Research practice	2	3/90		2
Semester 3						
Modules of Individual Educational Paths	**Physics of Functional Materials**					
	FPM 7401	Semicoductor Material Physics	3	5/135	2+1+0	3
	FDM 7402	Physics of Dielectric Materials	3	5/135	2+1+0	3

	RESSTT 840	Radiation Effects and Modern Spectroscopy of Solids	3	5/135	2+1+0	3
	Physical and Chemical Processes in Materials					
	FP 7401	Surface Physics	3	5/135	2+1+0	3
	SM 7402	Achievements of Materials	3	5/135	2+1+0	3
	RMM 8403	Radiation Modification of Materials	3	5/135	2+1+0	3
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					
	NIRD III	Research Seminar III	2	3/90		3
	Professional Practice					
	PP	Pedagogical Practice	3	5/135		3
Semester 4						
Modules of Individual Educational Paths	**Physics of Functional Materials**					
	KMN 8404	Computer Modeling of Nanomaterials	3	5/135	2+1+0	4
	VIE 8405	Renewable Energy Sources	3	5/135	2+1+0	4
	MSE 8406	Materials for Solar Energy	3	5/135	2+1+0	4
	Physical Basis of Material Modification					
	SNPM 8404	Properties of New Polymeric Materials	3	5/135	2+1+0	4
	PNP 8405	Semiconductor Nanomaterials and Devices	3	5/135	2+1+0	4
	Nan 8406	Nanoelectronics	3	5/135	2+1+0	4
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					
	NIRD IV	Research Seminar IV	2(+1,5+3)	3/90		4

	Professional Practice					
	IP	Research practice	1	1.5/45		4
Semester 5						
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					
	NIRD V	Research Seminar V	2 (+3)	3/90		5
Semester 6						
Additional Types of Training	**Doctoral Student's Reseach Work and Fullfilment of Dissertation**					
	NIRD VI	Research Seminar VI	2 (+3)	3/90		6
Final Attesta-tion	KE	Complex Examination 1credit	1	1.5/45		6
	ZD	Dissertation Fullfilment and Defence	4	6/180		6

For the PhD Programme 6D060500 – Nuclear Physics, the self-assessment report states the following **intended learning outcomes**:

I. **Knowledge**

Knowledge

1. Know the basic laws of nuclear physics, Nuclear Physicsand particle physics, nuclear reactors, condensed matter
2. Be able to apply the experimental, theoretical and computational methods of research in professional activities
3. To be able to independently carry out experimental or theoretical research for scientific and industrial problems using modern techniques and methods of calculation and research
4. To be able to professional use of modern equipment and instruments
5. To be able to formulate the terms of reference, to use information technology and software packages for the design and calculation of physical facilities, use of the knowledge of methods of analysis of environmental and economic efficiency in the design and implementation of projects
6. To be able to organize and manage staff, taking into account the motives of ways to

develop business conduct personnel applied to assess the quality and effectiveness of the personnel

II. **understanding**

understanding

1. Understand the current professional issues, modern nuclear technology, science and technology policy of nuclear sphere of activity
2. Understand the classification of elementary particles
3. Be able to describe the physical phenomena at the level of elementary particles
4. Be able to discuss the assigned tasks
5. Be able to explain the results obtained, both theoretical and experimental
6. Be able to find ways of solving the assigned tasks
7. Be able to analyze the technical and numerical and theoretical developments

Results of training programs

1. application

application

1. Applies the development of methods of recording and ionizing electromagnetic radiation and measuring methods of the quantitative characteristics of nuclear materials
2. Adopts the basic laws of physics in the specific theoretical and practical problems
3. Demonstrates a good knowledge of general physics and specialize in subjects in "Nuclear Physics"
4. Uses the basic concepts, laws of Nuclear Physics to the solution of its tasks
5. For resolutions before them tasks using all the skills and knowledge obtained during the training for the program
6. Practicing new ways to meet new challenges
7. Writes articles, abstracts, reviews, etc.

2. Analysis

analysis

1. Analyzes the assigned tasks
2. Carry out the calculation, and conceptual design studies of modern physical plant and equipment
3. Assesses risk and determines the safety measures for new plants and technology, makes analyzes and scenarios of potential accidents, developing methods to reduce the risk of their occurrence

4. Sees the errors and omissions in solving problems, both theoretical and experimental design
5. Identifies all possible moves to tasks
6. Assesses the importance of the tasks in front of undergraduates
7. The results are compared with other authors such problems

3. The synthesis

the synthesis

1. Writes articles, abstracts, reviews in various magazines, including overseas
2. Proposes a plan of the experiment
3. Objectives of the scheme at the theoretical level
4. Formulate the problem correctly
5. Plans to conduct a physical experiment
6. Offers new ideas in solving tasks

4. evaluation

evaluation

1. Assesses the logic of written text
2. Evaluates the compliance findings available data
3. Assesses the significance of a particular product activity
4. Discusses the theoretical and experimental questions arising from the resolution of various problems
5. Compares the theoretical and experimental data
6. Know how to choose the necessary literature on the subjects

The following **curriculum** is presented:

Name of modules	Discipline code	**Names of disciplines (modules)** and types of activities	Cre dit	**ECTS**	**Lec/pra c/Lab.**	**Sem**
1. Core Compulsory Module	SDPPh 7201	Physics of accelerator and at-om reactors	3	5	2+1+0	1
2. Core Elective Module 1	NPR 7202	Nuclear power reactors	3	5	1+2+1	1
	EFS 7301	Electrodynamics fewbody sys-tems	3	5	1+2+0	1
	FFI 7301	Fields and fundamental interac-tion	3	5	1+2+0	1
	PhAAR 7202	Physics of accelerator and at-om reactors	3	5	1+2+0	1
	NU 7301	Nucleusynthesis in the Universe	3	5	1+2+0	1
	APSO 7301	Atomic power station operation	3	5	1+2+0	1

3. Core elective module II	RM 7302	Renormalization methods	3	5	1+2+0	2
	MSQ 7302	Method of secondary quantiza-tion	3	5	1+2+0	2
	CTBS 7303	Coloumb's three body systems	3	5	1+2+0	2
	QTSSSB 7303	Quantum theory of scattering systems of several bodies	3	5	1+2+0	2
	MRIPNR 7303	Methods of registration and identification of products of nuclear reactions	3	5	1+2+0	2
	LHC.QB 7303	Large Hadron Collider. On a quantum boundary	3	5	1+2+0	2
	MANE 7303	Mechanical action of nuclear explosion	3	5	1+2+0	2
	AChPTPhE 7303	Accelerators of the charged par-ticles and the technician of physical experiment	3	5	1+2+0	2
4. Specialized elective module I	QTMP 8304	Quantum theory of many parti-cles	3	5	1+2+0	3
	TQTAM 8304	The quantum theory of the an-gular momentum	3	5	1+2+0	3
	OSA 8304	Optical spectrum of atoms	3	5	1+2+0	3
	PEI 8305	Physics of electromagnetic interactions	3	5	1+2+0	3
	TTMQMQM 8305	The theory of the moment of quantity of movement in the quantum mechanics	3	5	1+2+0	3
	NRHI 8305	Nuclear reactions with heavy ions	3	5	1+2+0	3
	TGF 8403	Electronic methods of nuclear-physical experiment	3	5	1+2+0	3
	QE 8306	Quantum electrodynamics	3	5	1+2+0	3
	DNRSK 8306	Direct nuclear reactions and structure of kernels	3	5	1+2+0	3
	SA 8306	Subatomic physics	3	5	1+2+0	3
	MQTFSPh 8306	Methods of quantum theory of fields of statistic physics	3	5	1+2+0	3

5. Specialized Elective Module 2	PhEP 8307	Physics of elementary particles	3	5	1+2+0	4
	PMPQM 8307	Problems of many particles in quantum	3	5	1+2+0	4
	NRPI 8307	Nuclear reactors and power installations	3	5	1+2+0	4
	TNR 8307	The theory of nuclear reactors	3	5	1+2+0	4
	VMQPTB 8308	Variational methods of quantum problem of three bodies	3	5	1+2+0	4
	MIEILENK 8308	The mechanism of interaction of easy ions low energy with nuclear kernels	3	5	1+2+0	4
	PhHE 8308	Physics of high energy	3	5	1+2+0	4
	QC 8308	Quantum chrodynamics	3	5	1+2+0	4
6. Transferable Module 1 Doctoral Student's Reseach Work	**Additional Types of Training**					
	RS I	Research Seminar I	3	5		1
	RS II	Research Seminar II	3	5		2
	RS III	Research Seminar III	3	5		3
	RS IV	Research Seminar IV	3	5		4
	RS V	Research Seminar V	3	5		5
	RS VI	Research Seminar VI	3	5		6
7. Transferable Module 2 Professional Prac-tice	PP	Pedagogical Practice	2	3		3
	RP	Research Practice	4	7		2,4
8. Transferable Module 3	PDD I	Preparation of Doctoral Disser-tation I	5	8		5
9. Preparation of Doctoral Disserta-tion	PDD II	Preparation of Doctoral Disser-tation II	5	8		6
TOTAL			**75**			

For the PhD Programme PhD programme 6D061100 – Physics and Astronomy, the self-assessment report states the following **intended learning outcomes**:

I Knowledge

- Major trends and directions of development of modern theoretical and practical astronomy and physics;
- About the specifics of the main content of specializations in the field of astronomy and physics;
- About the major scientific and technical problems and prospects of the development of science and technology, the relevant specialized training, their relationship with adjacent areas;
- Research methods physical and astronomical phenomens and processes;
- Different types and nature of the astronomical events and determination of its properties;
- Phase rule, thermodynamic bases for the construction of phase diagrams (analytical and experimental methods);
- The basis of the theory of stellar structure, galactic formation, stellar evolutionary models end etc.;
- The nature of the Big Bang, neutron star, black holes, white drawts and etc.;

II Understanding

- Classify the existing types and grades of celestial objects, their structure and properties in relation to the tasks with the use of databases and literature;
- Collect data on existing types and grades of celestial objects;
- Analyze research on chemical composition, structure and properties of celestial objects
- Describe and do drawings of parts and structural components of telescopes;
- Discuss the terms of reference for specific situations;

Results of training programs

III Application

- Typical and original methods of engineering calculation parameters astronomical processes (including the use of computers);
- Graphs, charts, nomograms, characterizing patterns of relationship between the structure and properties of celestial objects,
- Special materials and other information (including foreign language) to solve professional problems;
- Knowledge of methods of modeling, simulation and experimental research astronomical events, as well as methods of data processing and error estimates of analytical calculations;
- Methods and techniques for organizing labor, equipment, tooling, mechanization and automation to ensure the effective implementation of the astronomical researchs;
- Execution of charts, graphs, diagrams, charts, nomograms, and other professionally relevant images;

- Work with the technical documentation, technical literature, scientific and technical reports, manuals and other information sources;
- Programming of computer calculations of parameters and processes, use of computers for special tasks;
- Implementation of structural analysis, measurement, testing of materials and products;

engineering calculations on the basic types of professional tasks;

- Developing research plans, carry out scientific experiments;

IV Analysis

- Analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment;
- Verify compliance with development projects and technical documentation of regulatory documents;
- Classify the existing types and grades of celestial objects, their structure and properties in relation to the tasks with the use of databases and literature;
- Collect data on existing types and grades of celestial objects;
- Analyze research on chemical composition, structure and properties of celestial objects;

V Synthesis

- Examine the professional literature and other scientific and technical information, the achievements of domestic and foreign science and technology in the field;
- Participate in the research, or performing technical developments;
- To carry out the collection, processing, analysis and systematization of scientific and technical information on the subject (target);
- Composes reports (sections of the report) on the topic or section (step, task)
- Be a speaker at the conference, and so on;
- Make a plan of the article, of course work;
- Write an article summary, a review of historical and theoretical plan;
- Write a term paper on an approved topic, speech on defense;
- Synthesize skills acquired in the course of research practice;
- Offer training plan;
- Make a plan of the dissertation research;
- Make a plan on finding the bibliographic research;

VI Evaluation

- Demonstrate knowledge and understanding of the developmental obtained at the level of higher education, which are the basis for the original or the possibility of development or application of ideas, often in the context of scientific research;
- Apply knowledge, understanding and ability to solve problems in new or unfamiliar situations and contexts within broader (or multidisciplinary) areas related to the field of study;

- Integrate the knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge;
- Clearly communicate their conclusions and the knowledge and rationale to specialists and non-specialists;
- To continue learning on their own.
- Critically analyze existing concepts, theories and approaches to the study of the processes and phenomena;
- To integrate the knowledge gained in the different disciplines, to use them for analytical and administrative tasks in the new unfamiliar surroundings;
- Creative thinking and creative approach to solving new problems and situations;
- Conduct information analysis and information-bibliographic work using modern information technologies;
- Summarize the results of experimental research and analysis in the form of a thesis, article, report, analytical notes, etc.

The following **curriculum** is presented:

Name of modules	Names of disciplines (modules) and types of activities		Credit	ECTS/hours	Lec/prac/Lab.	Sem
1. State Compulsory Module (3 credits)	7201	Methods of Nonlinear Physics in Astronomy	3	5/135	2+1+0	1
2. Elective Module of Professional Specialization- 15 credits	Digital Technology of Astrophysics		5			
	CA 7202	Computational Astrophysics	3	5/135	2+1+0	1
	NATS 7203	Nonlinear Analyses of Time Series	2	3/90	1+1+0	1
	Dynamical Chaos in Astrophysics		5			
	SOSR 7204	Self-organization of Solar Radiation	3	5/135	2+1+0	2
	SAP 7205	Scale-invariant Astrophysical Phenomena	2	3/90	1+1+0	2
	Contemporary Cosmology		5			
	TSE 7206	Theory of Stars Evolution	3	5/135	2+1+0	3
	RG 7207	New models of Galaxy structure	2	3/90	1+1+0	3
3. Modules of	MIOT 1					

Individual Educational Paths - 20 credits	Nonlinear Dynamics in Cosmology					
	SChRC 8301	Selected Chapters of Relativistic Cosmology	3	5/135	2+1+0	2
	CSTh 8302	Cosmic Strings Theory	3	5/135	2+1+0	2
	Non-stationary Universe					
	EBEU 8301	Experimental bases of expansion of the Universe	3	5/135	2+1+0	2
	MUE 8302	Models Universe expansion	3	5/135	2+1+0	2
	MIOT 2					
	Physics of planets					
	PhCA 8203	Physical characteristics of planets	3	5/135	2+1+0	3
	AP 8304	Atmosphere of planets	3	5/135	2+1+0	3
	Optical research of planets					
	ESRP 8303	Equipment spectral research of planets	3	5/135	2+1+0	3
	PASD 8304	Processing of astrophysical spectral data	3	5/135	2+1+0	3
	MIOT 3					
	Physical regularities of evolution of variable stars					
	CHEV 8305	Charts of evolution of variable stars in various variables	3	5/135	2+1+0	4
	NPh 8306	Nonlinear physical regularities of evolution of variable stars	3	5/135	2+1+0	4
	Statistical analysis of astrophysical supervision					
	NAAS 8305	Noise assessment in astrophysical supervision	3	5/135	2+1+0	4
	MAAS 8306	Methods of allocation of astrophysical signals from noise	3	5/135	2+1+0	4
Doctoral Student's Reseach Work and Fullfilment of Dissertation – 28 credits	NIRD I	Research Seminar I	4	CC	1	
	NIRD II	ResearchSeminar II	3	CC	2	
	NIRD III	Research Seminar III	3	CC	3	
	NIRD IV	Research Seminar IV	3	CC	3	

	PDD V	Preparation of Doctoral Dissertation I	5	CC	5
	PDD VI	Preparation of Doctoral Dissertation II	10	CC	6
Professional Practice – 6 credits	PP	Pedagogical Practice	3	CC	3
	IP	Research practice	1,5	CC	2
	IP	Research practice	1,5	CC	4
Final Attestation – 5 credits	KE	Complex Examination	2	CC	2
	ZD	Dissertation Fullfilment and Defence	3	CC	6
TOTAL			75		

For the PhD Programme 6D072300 – Technical Physics, the self-assessment report states the following **intended learning outcomes**:

PhD-programme

The graduate of the Technical Physics PhD of Technics and Technologies Program should possess professional knowledge in their subject area; know the basics of industrial relations and management principles with regard to technical, financial and human factors.

1. **Knowledge**

1. Produce and defend an original significant contribution to knowledge
2. Demonstrate mastery of subject material
3. Be able to conduct scholarly activities in an ethical manner.
4. Methods of theoretical and experimental research in the field of technics and technical physics
5. Demonstrate broad knowledge in the fundamental areas of Technical Physics
6. Demonstrate ability to identify and seek out resources and information; apply these to guide research plan development
7. Knowledge of the current areas of research, key open questions and literature within their subdiscipline.

2. **Understanding**

1. Possess a broad foundation in the fundamentals of physics and a deep understanding of their chosen subfield, which will permit them to understand and critically evaluate current research.
2. Have the experimental, theoretical, and computational skills necessary to conduct independent responsible research and contribute to knowledge in their chosen subfield.

3. Identify new research opportunities, which may cross traditional discipline boundaries, plan effective strategies for pursuing these opportunities and conduct research that makes a new contribution to knowledge in their chosen subfield of physics.
4. Communicate both fundamental concepts of physics and details of their own research effectively, in written and oral form, to expert and non-expert audiences.
5. Competency in teaching using the best pedagogical methods as determined by current physics education research.
6. Understanding of scientific reasoning, i.e., the roles of theory, hypothesis, and experiment in the scientific method.

3. Application

1. A substantial body of knowledge at the frontier of a field of work or learning, including knowledge that constitutes an original contribution
2. Substantial knowledge of research principles and methods applicable to the field of work or learning
3. Cognitive skills to demonstrate expert understanding of theoretical knowledge and to reflect critically on that theory and practice
4. Cognitive skills and use of intellectual independence to think critically, evaluate existing knowledge and ideas, undertake systematic investigation and reflect on theory and practice to generate original knowledge
5. Expert technical and creative skills applicable to the field of work or learning
6. Communication skills to explain and critique theoretical propositions, methodologies and conclusions
7. Communication skills to present cogently a complex investigation of originality or original research for external examination against international standards to peers and the community
8. Expert skills to design, implement, analyse, theorise and communicate research that makes a significant and original contribution to knowledge and/or professional practice

4. Analysis

1. Be able to summarize major central issues and current research problems in their field.
2. Be able to communicate the major tenets of their field and their work orally and in writing for students, peers and the lay public.
3. Be able to explain and identify areas of uncertainty in their fields.
4. Be able to identify areas where ethical issues may arise in their work or discipline, and articulate strategies for dealing with them.
5. Have designed, carried out and presented an original work of research at the leading edge of their discipline.

6. the ability to analyze and interpret quantitative results, both in the core areas of physics and in complex problems that cross multiple core areas.

5. The synthesis

1. Establish expertise in focused areas of physical theory and experiment

2. Gained exposure in current topics in theoretical and experimental physics in specific areas of physics research
3. Produced directed study or original research in theoretical or experimental physics in a specific discipline
4. Should be able to design and conduct original experiments in order to investigate physical phenomena.
5. Should be able to analyze data and publish these results in scientific journals.
6. Should be able to construct original theories in order to explain or predict physical phenomena.
7. Should be prepared to follow a career path towards quality positions in academia or assume leading technical roles in a variety of industries.

6. Evaluation

1. Bring together existing knowledge, identify, and seek out resources, information; apply these to evaluate and apply your own research findings as well as those of others. Apply research findings as appropriate.
2. The ability to analyze critically and evaluate one's findings and those of others, to summarize document, report and reflect on progress
3. Appreciate the need for and show commitment to continued professional development
4. Take ownership for and manage one's career progression, set realistic and achievable career goals, and identify and develop ways to improve employability
5. Evaluate the impact of solutions to problems of technics and technology in a global, economic and environmental context.

The following **curriculum** is presented:

Title of modules	Course code	**Title of courses**	**Credit**	**ECTS/ hours**	**Lec/prac/Lab.**	**Sem.**
		Semester 1				
1. Compulsory State Modules		**Compulsory State Module 1**				
	TSFK 7201	Thermodynamics, statistical physics and	3	5/135	1+2+0	1

- 3 credits		physical kinetics				
2. Elective Modules of Professional Specialization - 15 credits	**6D072301 - Thermophysical processes and Heat Engineering**					
		Elective Module of Professional Specialization 1				
	APT 7202	Actual problems of heat and mass transfer	3	5/135	1+2+0	1
		Elective Module of Professional Specialization 2				
	SMTKS 7203	Statistical model of turbulence in the calculation of the combustion of liquid fuels in the combustion chambers	3	5/135	1+2+0	1
	6D072302 - Technical Physics and Radioelectronics					
		Elective Module of Professional Specialization 1				
	IVTK 7202	Selected questions of the theory of convective heat transfer	3	5/135	1+2+0	1
		Elective Module of Professional Specialization 2				
	FKS 7203	Condensed Matter Physics	3	5/135	1+2+0	1
4. Additional Types of Training - 34 credits	NIRD I	Research Seminar I	1	1.66/45		1
Semester 2						
2. Elective Modules of Professional Specialization - 15 credits	**6D072301 - Thermophysical processes and Heat Engineering**					
		Elective Module of Professional Specialization 3				
	DMPKT 7204	Two-dimensional modeling of convective heat and mass transfer	3	5/135	1+2+0	2
		Elective Module of Professional Specialization 4				
	IATCh 7205	Investigation of aerodynamic and thermal characteristics of heat and mass transfer in combustion chambers	3	5/135	1+2+0	2
		Elective Module of Professional Specialization 5				
	ChIDT7206	Numerical study of two-phase reacting flows	3	5/135	1+2+0	2
	6D072302 - Technical Physics and Radioelectronics					
		Elective Module of Professional Specialization 3				
	SChS 7204	Synchronization of Chaotic Systems	3	5/135	1+2+0	2
		Elective Module of Professional Specialization 4				
	FR 7205	Fractals in Radio Location	3	5/135	1+2+0	2
		Elective Module of Professional Specialization 5				
	GPSE 7206	Heterojunction in Solar Energetics	3	5/135	1+2+0	2
4. Additional Types of Training - 34 credits	NIRD II	Research Seminar II	8	13/360		2
	IP	Research internship	2	3/90		2
Semester 3						
3. Modules of Individual Educational Paths - 18 credits	**6D072301 - Thermophysical processes and Heat Engineering**					
		Computer technologies and the optimization of heat and mass transfer processes				
	OPTKS 8301	Optimization of heat and mass transfer processes in the combustion chambers of TPP	3	5/135	1+2+0	3
	KTMP 8302	Computer technology in the modeling of heat and mass transfer	3	5/135	1+2+0	3
		Computer modeling of heat and mass transfer				
	KMRT 8303	Computer simulation of reacting flows in combustion chambers	3	5/135	1+2+0	3

	TKZh 8304	Heat and mass transfer in liquid drops	3	5/135	1+2+0	3
		The problems of power engineering				
	VVPT 8305	The influence of external factors on the processes of heat and mass transfer in combustion chambers	3	5/135	1+2+0	3
	MGET 8306	Methods gasification energy consumption	3	5/135	1+2+0	3
	6D072302 - Technical Physics and Radioelectronics					
		Physics and Tecniques of Optical Communications				
	FSChP 8301	Physics of Stochastic and Chaotic Processes	3	5/135	1+2+0	3
	FTOS 8302	Physics and Tecniques of Optical Communications	3	5/135	1+2+0	3
		Physics of Open Systems				
	FOS 8303	Physics of Open Systems	3	5/135	1+2+0	3
	TIE 8304	Theory of Information and Entropy	3	5/135	1+2+0	3
		Information Technologies on the Base of Dynamical Chaos				
	ITDCh 8305	Information Technologies on the Base of Dynamical Chaos	3	5/135	1+2+0	3
	FOYa 8306	Physics of Optical Phenomena in Nanostructured Semiconductors	3	5/135	1+2+0	3
4. Additional Types of Training - 34 credits	NIRD III	Research Seminar III	1	1.66/45		3
	PP	Pedagogical Internship	3	5/135		3
Semester 4						
4. Additional Types of Training - 34 credits	NIRD IV	Research Seminar IV	8	13/360		4
	IP	Research internship	1	1.66/45		4
Semester 5						
4. Additional Types of Training - 34 credits	NIRD V	Research Seminar V	1	1.66/45		5
Semester 6						
4. Additional Types of Training - 34 credits	NIRD VI	Research Seminar VI	9	15/405		6
5. Final Attestation - 5 credits	KE	Complex Examination	1	1.66/45		6
	ZD	Dissertation Fulfillment and Defence	4	7/180		6
TOTAL			**75 credits**			

For the PhD Programme 6D060400 – Physics, the self-assessment report states the following **intended learning outcomes**:

Knowledge:

– about development of the modern science in a whole, tendencies and directions of development of theoretical and experimental physical science;
– about schools of thoughts of the Kazakhstani and world physical science;
– about norms of interaction in scientific community;
– about directions of the international scientific activity in the field of theoretical and experimental physical sciences;
– about scientific theoretical and experimental physics ethics of the scientist-researchers of theoretical physical and experimental science.

Understanding:
– fundamental bases of theoretical and experimental physics;
– the physicist and the technician of power saving up technologies and renewed energy sources;
– metrological maintenance of scientific researches;
– tendencies of development of a theoretical and experimental physical science.

Application:
- application of equipment and devices, specialized computer programs to complex problems solution;
- plan, develop, realize and coordinate process of scientific researches theoretical physics;
- have abilities to generate new ideas (creations);
- bring contribution of own original decisions, research, expanding borders of scientific area.

Analysis:
- analyze of obtained information on professional scientific level;
- protection of the intellectual rights;
- critically analyze, estimate and compare new and difficult ideas.

Synthesis:
- synthesize new knowledge in the selected field;
- synthesize theoretical and experimental scientific activity.

Evaluation:
- evaluation of quality of investigations in this subject field;
- track and comprehend the development of theory and practice critically;
- inform colleagues and scientific community about the knowledge and achievements in research field.
-

The following **curriculum** is presented:

Name of modules	Discipline code	Names of disciplines	Credit	ECTS credit/ hours	Lec/ prac/ lab	Sem
1. Compulsory State Module 1	FTEV 7201	Physics and technique of energy saving and renewable energy	3	5/135	2+1+0	1
2. Elective Modules of Professional Specialization	TEMFP 7202	Theoretical and experimental methods of plasma physics. Part 1	3	5/135	1+2+0	1
	PNSAYa 7204	The practice of writing articles in English	3	5/135	1+2+0	1
	TEMFP 7203	Theoretical and experimental methods of plasma physics. Part 2	3	5/135	1+2+0	2
	DGFPP 7205	Additional chapters of dense plasma physics	3	5/135	2+1+0	2
	IVFNP 7206	Selected topics of nonideal plasma physics	3	5/135	2+1+0	2
	SMMTF 7202	Modern mathematical methods of theoretical physics. Part 1	3	5/135	1+2+0	1
	TGPTF 7204	Group theory and its applications in theoretical physics	3	5/135	1+2+0	1
	SMMTF 7203	Modern mathematical methods of theoretical physics. Part 2	3	5/135	1+2+0	2
	TFV 7205	Theory of fundamental interactions	3	5/135	2+1+0	2
	KTP 7206	The gauge field theories	3	5/135	2+1+0	2
	SMMTF 7202	Metrological maintenance of physical researches. Part 1	3	5/135	1+2+0	1
	TGPTF 7204	The statistical treatment in research	3	5/135	1+2+0	1
	SMMTF 7203	Metrological maintenance of physical researches. Part 2	3	5/135	1+2+0	2
	TFV 7205	The physical basis of thermal energetics		5/135	2+1+0	2
	KTP 7206	Environmental monitoring CHP	3	5/135	2+1+0	2
3. Modules of Individual Educational Paths MIOT 1	TESNP 8301	Thermodynamic and electrodynamic properties of strongly coupled plasmas	3	5/135	1+2+0	3
	IVEP 8302	Selected topics of plasma electrodynamics	3	5/135	1+2+0	3
	IGMOTO 8301	Selected chapters of GR mechanics	3	5/135	1+2+0	3
	CMOTO 8302	Numerical Methods for General Relativity	3	5/135	1+2+0	3
	IVTKTO 8301	Selected problems of the theory of heat transfer kovektivnogo	3	5/135	1+2+0	3
	TNVS 8302	Heat and mass transfer in nonlinear-viscous media	3	5/135	1+2+0	3

3. Modules of Individual Educational Paths MIOT 2	DHPKS 8303	Dynamic characteristics of dense coulomb systems	3	5/135	1+2+0	3
	KMFP 8304	Stability of motion in general relativity	3	5/135	1+2+0	4
	RNM 8303	Relativistic celestial mechanics	3	5/135	1+2+0	3
	UDMOTO 8304	Stability of motion in general relativity	3	5/135	1+2+0	4
	TPE 8303	Ecological problems head and power engineering	3	5/135	1+2+0	3
	MVGP 8304	Modelling of burning liquid atomized fuel	3	5/135	1+2+0	4
3. Modules of Individual Educational Paths MIOT 3	FPP 8305	Dusty plasmas physics	3	5/135	1+2+0	4
	OTRTSP 8306	Fundamentals of the theory of scattering and the stopping power of plasma	3	5/135	1+2+0	4
	ZTTMOTO 8305	Three bodies problem in General Relativity	3	5/135	1+2+0	4
	FKZ 8306	Physics of compact Stars	3	5/135	1+2+0	4
	KTKG 8305	Convectional heat-and-mass transfer in the tiny liquid	3	5/135	1+2+0	4
	MSGTRS 8306	Modelling of burning of liquid fuel in combustion chambers	3	5/135	1+2+0	4
		Total Credit of Theoretical Training	**36**	**60 ECTS /1620 hours**		
Additional Types of Training						
4. Doctoral Student's Research Work and Fullfilment of Dissertation	NIRD I	Research Seminar I	1	3.5/94.5		1
	NIRD II	Research Seminar II	8	28/756		2
	NIRD III	Research Seminar III	1	3.5/94.5		3
	NIRD IV	Research Seminar IV	8	28/756		4
	NIRD V	Research Seminar V	1	3.5/94.5		5
	NIRD VI	Research Seminar VI	9	31.5/850.5		6
5. Professional Practice	PP	Pedagogical Practice	3	5/135		3
	RP	Research Practice	3	5/135		2, 4
		Total Credit of Additional Training	**34**	**108 ECTS / 2916 hours**		
6. Final Attestation	KE	Complex Examination	1	3.5/94.5		6
	ZD	Dissertation Fulfillment and Defence	4	14/378		6
		Total Credit of Final Attestation	**5**	**17.5 ECTS / 472.5 hours**		
		TOTAL CREDIT	**75**	**185.5 ECTS / 5008.5 hours**		

C Peer Report for the ASIIN Certificate

1. Formal Information

Criterion 1.1 Formal Information

Evidence:

- Self assessment report

Preliminary assessment and analysis of the peers:

The self-assessment reports state the relevant formal information on duration, credit points, study form. The questions with regard to the credit point conversion are dealt with elsewhere in this report (criterion 3.2). The local specificity that the intake varies quite a lot in some programmes is due to the fact that the Ministry of Education and Science in Kazakhstan decides on an annual basis how many PhD graduates are needed each year and also what universities should take over the responsibility for their education. Therefore the programmes' capacities have not been conceived and strictly planned for a certain number of students, but are flexibly customized to the number of the grants allocated to Al-Farabi University for the current year (cf. also staff).

Criterion 1.2 Legal relationship: mutual rights and duties

Evidence:

- Academic Policy of the Al-Farabi University (accessible in Russian under http://www.kaznu.kz/content/files/pages/folder165/akadpol.pdf, ref. date 20.08.2014), English version submitted with self-assessment report

Preliminary assessment and analysis of the peers:

Mutual rights and duties are clearly described and transparently explained in the Academic Policy of the al-Farabi State University. The Academic Policy is accessible for every interested party; the Russian version is more detailed and more extensive than the English translation presented to the panel beforehand. Together with the findings from the on-site visit the shortened version has, however, provided all the relevant information for the assessment.

Given the fact that studying in a PhD programme is only possible on a grant base and the PhD students are not only paid scholarship for their studies but also are supported for conducting at least 2 months of research work abroad every year, there is a range of duties which they are supposed to fulfill (explained elsewhere in the report, e.g. criterion 3.3 teaching methodology). The same is true reciprocally for the Higher Education Institution since the panel found out that the allocation of grants is conducted on a very competitive base among all Kazakh Higher Education Institutions.

Final assessment of the peers after the comment of the Provider regarding criterion 1:

The panel deems the criteria to be fulfilled.

2. Courses/Modules: Content, Policy and Implementation

Criterion 2.1 Learning outcomes of the course/module

Evidence:

- cf. Objectives matrix
- cf. Module handbook
- cf. Academic Policy

Preliminary assessment and analysis of the peers:

The panel deemed that the intended as well as achieved learning outcomes of the programmes are formulated in a clear and concrete way and correspond to the level 8 of the European Qualifications Frameworks for Life-long learning (EQF).

For the programme New materials technology, the self-assessment report states "Analyze the scientific and technical information on the subject of experiments for the preparation of surveys, reports and scientific publications, participation in the reporting of the assignment", which can be roughly allocated to the desciptor "are capable of critical analysis, evaluation and synthesis of new and complex ideas", or the formulation that graduates must demonstrate "commitment to the development of new ideas or processes at the forefront of work or study contexts including research" is in line with the descriptor "can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society", and also the descriptor of EQF stating "the most advanced skills for synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice".

The same is true for the programme Nuclear Physics: for instance, the learning outcome "Applies the development of methods of recording and ionizing electromagnetic radiation and measuring methods of the quantitative characteristics of nuclear materials" is roughly reflecting the requirement of the level 8 of EQF stating "have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity".

Also, the learning outcomes of the programme Physics and Astronomy reflect the due level: the competence of integrating "the knowledge to cope with the complexities and make judgments based on incomplete or limited information, based on ethical and social responsibility for the use of these judgments and knowledge" is defined, as well as the competence to "clearly communicate their conclusions and the knowledge and rationale to specialists and non-specialists", which is reflecting the requirements

The same is true for the programmes Physics stating that graduates should be able to "synthesize new knowledge in the selected field" and "synthesize theoretical and experimental scientific activity" as well as Technical Physics, expecting graduates to "have designed, carried out and presented an original work of research at the leading edge of their discipline" (EQF descriptor: "knowledge at the most advanced frontier of a field of work or study and at the interface between fields").

Based on the self- assessment report and the module descriptions, the audit team questioned the level of the PhD programmes since many of the modules stated in the curricula are demonstrating rather basic level at least as far as titles are concerned, e.g. "Scientific Bases of the Development of New Materials", "Introduction to the field theory of elementary particles, quarks and leptons" in case of Nuclear Physics, "Experimental bases of expansion of the Universe" in case of Physics and Astronomy. Nevertheless, based on the discussions and additional information provided onsite, the panel deemed the implementation of the modules to be on the due level and also to offer a laudable customized and individual approach to teaching at PhD level (for more details, cf. the part "curriculum").

Although a few formulations were not quite clear (e.g. "Demonstrate knowledge and understanding of the developmental obtained at the level of higher education, which are the basis for the original or the possibility of development or application of ideas, often in the context of scientific research" in the New Materials Technology), apparently due to translation issues, the intended learning outcomes and the whole conceptual framework of the programmes remained clear.

The publication of the intended programme learning outcomes and their accessibility to all relevant stakeholders, especially teaching staff and students, play a crucial role for transparency and for quality-related reference by the stakeholders. The panel could not find any proof for the fact of publishing of learning outcomes as they have been presented to the panel. From the audit of Bachelor's and Master's programme of the same cluster, the panel acknowledged that the learning outcomes are published in the internal document-management system UNIVER.; However, under these premises the prospective study candidates cannot access them, which is crucial for a thorough decision making and comparison of different programs. Therefore, the panel considered the publication of the learning outcomes accessible to the public on the website of the university a necessity.

Criterion 2.2 Prospects of the labour market and practical orientation

Evidence:

- cf. statistics on graduates employment in terms of numbers and market sector
- Overview of companies for practical training
- Discussions with students/alumni

Preliminary assessment and analysis of the peers:

Due to the fact that there is only a very restricted number of PhD graduates, all graduates are employed in the shortest time after graduation. Additionally, the students confirmed that fellow students from previous cohorts were employed either by the university itself, by other universities of Kazakhstan or by external research institutes such as Institute of Combustion Problems, Astrophysical Institute named by V.G. Fesenkov, National Space Agency of Kazakhstan Astrophysical Institute of the Academy of Sciences of the Kazakh Soviet Socialist Republic, Institute of Nuclear Physics or National Nuclear center of the Republic of Kazakhstan. Also, work in the industry is not seldom, such as the Atomic Company KAZATOMPROM (national operator of the Republic of Kazakhstan for import and export of uranium, rare metals, nuclear fuel for power plants), Ulba Metallurgical Plant, JSC "Kazakhtelecom" and KPMG. While employment statistics showed that PhD graduates are not always employed in line with their main field, e.g. graduates of Physics and Astronomy employed by the Institute of Nuclear Physics, which the panel considered this to be a proof rather of a certain interdisciplinary of qualification than an indication that graduates would not find an employment in their chosen speciality.

The panel considered a very positive tendency that PhD students are not only involved in research projects of their professors, allowing for additional research experience and additional funding during this time. Some of them also teach undergraduate students which gives them another opportunity for pedagogical practice. The panel deemed this to be positive for their further teaching activities.

With regard to the very high demand for graduates as claimed by the HEI states that graduates of the programmes often apply for a grant financing from the government and/or domestic or international funds as private researchers.

Criterion 2.3 Admission requirements

Evidence:

- Academic Policy
- Website: http://www.kaznu.kz/ru/13691/page/welcome///, as of 21.08.2014

Preliminary assessment and analysis of the peers:

The admission rules for the PhD programmes are clearly defined in the academic policy, based on the law developed by the Ministry of Education and Science of Kazakhstan based on the article number 4 of the law on Education (as of June 27, 2007). The admission decisions are made by the admission commission, including 3 university's professors nominated by Rector's decree.

As mentioned above, the PhD studies are only provided based on educational grants, self-funded students cannot study in PhD degrees. The state grants are awarded based on the best results of admission exams, which are an extensive foreign language test (TOEFLITP, TOEFL, at least 560 points, DELF – B2 or DALF C1, Deutsche Sprachprüfung für den Hochschulzugang – C1) and the other being a programme based written exam which is focused on the chosen subject and envisaging two theoretical questions and one essay. The tests are conducted by the National Testing Center.

All in all, the admission regulations allow for a consistent selection of potentially successful study candidates, since not only solving theoretical problems but also the ability to clearly structure, formulate and conclude scientific texts is tested. Also, the thorough knowledge of the foreign language is an important prerequisite, given that PhD students are supposed to conduct research abroad, be able to read and synthesize technical literature, as well as communicate without any linguistic obstacles with their foreign supervisors. The panel found this to be the case for the students they met during the onsite visit.

Criterion 2.4 Contents

Evidence:

- Module Descriptions
- Curriculum
- Discussion with students
- Discussion with teaching staff

Preliminary assessment and analysis of the peers:

The curricula of all programmes contain a range of obligatory modules which are derived from the standards set by the ministry. While the core or compulsory modules cannot be changed by the university, it has the autonomy to design elective courses which compose around 70% of all courses taken (State Compulsory Module amount to 10 credits, Elective Module of Professional Specialization, designed by the HEI, to 15 credits as well as Modules of Individual Educational Paths to 20 credits). The curriculum moreover includes six obligatory research seminars. The PhD students are free to select the elective disciplines. They usually ask for advice their supervisors, being able to choose among of 3-4 different teachers - which proves a very good human resources base. The panel also learned that the form of the lectures and seminars is different from the way these are taught for Bachelor's and Master's students – it is rather a discussion than lecturing within a very small circle: 1-2 students discussing with the professor, supported by additional reading and research related to the field of research implemented by students.

The students and teaching staff confirmed the statement of the programme coordinators that these modules do not exceed 25-30% of their working time, while the mere reading of the curriculum might lead to the assumption that too much time is allocated to basic scientific courses which would not allow for a PhD level activity. Although the curriculum already allows for a considerable flexibility by offering different electives and also possibilities of individual paths, the HEI is planning to get more autonomy for designing the curriculum in future, which the panel finds strongly recommendable.

The option of selecting individual paths is already helpful, but a better option would be a range of targeted support modules for developing professional skills, e.g. by delivering enhanced modules/workshops on scientific writing in English. So far, only the PhD programme Physics" includes a module dedicated to scientific writing in the English language, namely "The practice of writing articles in English". Other themes could be "Successful Presenting at Conferences" as well as "Successful publishing strategies", or workshops for further development of teaching skills.

Referring hereto, the panel noticed that the module descriptions presented did not correspond to the findings of the onsite visit. The module titles insinuated a rather basic level of the related disciplines (e.g. "Scientific Bases of the Development of New Materials", "Introduction to the field theory of elementary particles, quarks and leptons", "Experimental bases of expansion of the Universe"). However, after convincing discussions with teaching staff and students during the onsite visit, the panel evaluated the modules as adequate for the due level.

For instance, for the above mentioned research seminars for every semester the detailed module descriptions are missing. The panel was informed that these research seminars are targeted at general advice and exchange among the supervisors and students and that the contents of these session are very variable. This flexibility was considered absolutely positive and laudable, but it has to be reflected in the description of the modules in order to have a joint point of reference not only for students, but also for teachers. These descriptions are also crucial for internal quality assurance (aligning the modules to the intended learning outcomes and regular checking the achievement). For this reason, the panel strongly emphasized the need to reflect this option of maximum individual customization in the current module descriptions.

In summary, the current practice of documenting the modules should be revised: an update and completion the respective descriptions in order to make them reflect the high level of individuality and customization, publication on the website (and not just in the internal system UNIVER) in order to make them accessible and usable as reliable reference for all relevant stakeholders. All in all, it is recommendable to stick to the output-oriented module description than to the input-oriented. For instance, the module handbook of the programme Physics and Astronomy is rather input-oriented: the module objectives are formulated in a very generic and brief way (e.g. the module "Dynamical Chaos in Astrophysics": "It is necessary to have knowledge of Solar Radiation and Cosmic Rays Physics"), whereas the list of contents provides a detailed overview of the themes taught and topics relevant for the exam. The module description should contain a sound formulation of the module objectives, in line with the learning outcomes and programme objectives ensuring a sound and consistent programme design.

Final assessment of the peers after the comment of the Provider regarding criterion 2:

The university stated that structure of the website is dictated by the university officials but that the department is going to use the already available flexibility in determining the website content to publish the learning outcomes of its all programmes. The panel strongly encourages this initiative but considers the analysis provided in the report as valid until the university can demonstrate that the learning outcomes of the programmes have been published.

Further on, the university confirmed in its statement the willingness to revise the module handbooks. The panel update still deems it for a necessity to complement and continuously monitor the quality of the module handbooks for all programmes. The module handbook must moreover include a sound explanation of the calculation of the total module workload.

The university explained that there was a misleading information in the self-assessment report stating that graduates of Nuclear Physics and Astronomy are employed in the Institute of Nuclear Physics since there are no graduates of these programmes yet. The panel acknowledges the corrected information which does not change general the validity of the analysis of the peers that the prospects of the labour market are very good for graduates of Physics.

The university stated that specifically designed programme modules are in great need and have been very recently; “The practice of writing articles in English” was introduced for piloting and by now is implemented in all PhD programmes of the department. The implementation of further modules focusing on research-related competences are envisaged. The university also plans to revise the alignment of module titles and module contents in English as well as make the official documents reflect the flexibility offered to the PhD Students. The panel finds these initiatives commendable and encourages pursuing them. However, the statement provided in the report remains valid.

3. Courses/Modules: Structures, Methods and Implementation

Criterion 3.1 Structure

Evidence:

- Curriculum
- Discussion with students

Preliminary assessment and analysis of the peers:

For the completion of the PhD programme, two schedules play a crucial role – on the one hand, the presented curriculum which shows a thorough structure which allows for deepening scientific research foci, and, on the other hand, the individual research schedule which students agree on with their supervisors. This second schedule is to be agreed upon within three months after being accepted to the program under the support of a research adviser. This individual working plan must include the following: individual academic plan (choice of foci for modules), individual plan for research work, plan for research practical (implementation of experiments), a research proposal plan for the implementation of the dissertation, a plan for publishing and the internship abroad.

As far as the latter one is concerned, the panel deemed it to be an especially commendable practice to enable students to go abroad for visiting their second advisor every year for at least two months. Some students informed the panel that they are allowed to stay longer in cases they need it (e.g. the labs of the second institutions allow for better research) and that they can also "accumulate" this time to half a year and stay abroad for a longer time at once.

The strict structure of three years should, however, be revised. Especially for experimental thesis concepts more flexibility should be possible, as a high level of uncertainty has to be handled when the concept of experiments might have to be re-designed several times and where the reliability of results possibly must increased by questioning and continuous further developing of the research methodology. The students considered it sometimes almost impossible to handle the strict rules particularly in the final phase of the programme. The students informed the panel on the possibility of taking the final exams in the autumn session instead of the regular defense in May, in order to obtain at least a short prolongation for finalizing the thesis. However, the panel recommended revising the strict maximum duration of three years, making an option of prolongation for one or two semesters possible in well-justified cases.

Criterion 3.2 Workload

Evidence:

- cf. curriculum
- Discussions with students

Preliminary assessment and analysis of the peers:
Although the Academic Policy limits the maximum PhD student's workload to 57 hours, which would normally be considered too high by international comparison, the students confirmed that they consider their workload as feasible and acceptable (apart from the cases mentioned above where experimental thesis concepts made the completion in time impossible). The presented curricula show a rather varying workload within the modules. The peers have not gained a clear picture from the Academic Policy as to how many electives the students are expected to take every semester so that the peers cannot fully grasp the amount of mandatory expected workload. The students, however, considered the modules offered as necessary and helpful. They highlighted this way of learning, in almost individual or often indeed individual classes as beneficial for their thesis.

Nevertheless, for transparency reasons, it is absolutely necessary to revise the workload-relevant parts of the Academic Policy. For instance, on the page 36 there are two different numbers stating the amount of hours foreseen for one Kazakh credit: 15 and 3, which would result in a considerable difference in calculations. It is also not clear why the same number of Kazakh credits awarded for <u>Physics and Astronomy</u> and <u>Technical Physics</u> (both 75) results in different ECTS numbers – once 112.5 and once 125, as stated in the self-assessment reports. The panel was not able to gain final clarity on the planned workload, neither for students, nor for the teaching staff. The ratio for conversion stated in the self-assessment report seem not to have been implemented consistently (once it's 1,5, in other cases 1,66 and in third cases 1,7). In this context, it did not become clear how the university manages to offer one and the same elective course for only 1-2 students by 3 or 4 different teachers each, as it was stated (cf. comments on staff). For the final assessment, the panel therefore needs a thoroughly prepared overview of the way of calculating the credits for every programme, especially as far as electives are concerned.

Criterion 3.3 Teaching methodology

Evidence:

- cf. module descriptions

Preliminary assessment and analysis of the peers:

The University provides every student with two supervisors, one being a local supervisor and one a foreign full-time employed professor which the panel evaluated as very laudable and beneficial for the successful completion of the programme and achieving the learning outcomes.

The fact that the advisors are directly responsible for student's work, such as performing all required workloads on time, annual results of students and also their publication activities is also considered by the panel to be an additional evidence for a highly service-oriented approach to supervising.

The policy on polylingualism is also very commendable – the panel was told that the PhD students compiling their work in Kazakh must publish a Russian version, and vice versa. Even though there is always an English abstract of the thesis, the panel deemed that the advisors should encourage the students to write their thesis or at least the PhD-relevant publications in English, in order to make the work results visible internationally.

The university's policy of very early involving the students into research activities and experimental work is very positive and laudable. The PhD students confirmed that already undergraduate students are able to access research labs if they present a good research design to the head of the respective chair.

A very individual approach to adapting modules' contents to the need of the group is adequate for a programme on a PhD level. Also studying and conducting research abroad is very beneficial for strengthening the ability of working in international settings. Further enhancement could be achieved by handling the stays abroad more flexibly in cases where experimental work is conducted. Therefore, many students often use the whole six months of funding for studies abroad at once, and in case, they would have to come back in order to repeat some experiments or re-design the originally planned ones, a more flexible schedule would be beneficial. The panel suggests to consider enabling additional research time for well-justified cases where further experimental sessions abroad are needed in addition to the six months spent.

Criterion 3.4 Support and assistance

Evidence:

- Academic Policy
- Discussion with students

Preliminary assessment and analysis of the peers:

The peers deemed the support and advice infrastructure at the al-Farabi Kazakh State University to be especially well developed. By enabling an individual and customized approach to adapting the accompanying modules and also continuous support during the work on the thesis, the university provides a good setting for development of the skills and competences stated above. The students confirmed that in cases of problems, not only study-related but also private ones, advisors are always available for and ready to help. Especially the support and assistance provided by the foreign supervisor was considered very valuable since this connection not only allows for research and academic exchange in international setting, but also a strengthening of the language skills.

The students stated that their influence on the overall management of studies, especially their conceptual implementation, is rather low. Initiatives of student-driven peer-to-peer support are just starting and rather an innovative phenomenon in the Kazakh academic setting.

The audit team acknowledged the option to change the supervisor if needed. For this purposes, the students confirmed that they were free to address the deans and that there were cases where a PhD supervisor’s change had taken place.

Final assessment of the peers after the comment of the Provider regarding criterion 3:

The panel acknowledges the statement of the university on the calculation of the workload. However, it does not change anything on the fact that the workload expressed in Kazakh credit points reflects the teacher’s workload, whereas the ECTS are conceived as student’s workload so that no conversion by multiplication can reflect the student-centered approach to workload. A clear and transparent calculation of ECTS based on students workload and not on teacher’s workload, is absolutely necessary for due implementation of the programme and thorough monitoring of the workload. Further on, no clear statement has been made whether or not time slots for preparation, self study etc. have been taken into consideration. Therefore, the documents delivered did not add any clarity, so that the assessment of the panel on the workload remains valid – a sound revision of the general concept of the workload must be undertaken.

The university agreed with the panel that in cases of sophisticated experimental research thesis concepts, three years might not be enough to complete the PhD programme. The panel sees that the prolongation option is not provided by the Ministry of Education and Science and the university is not authorized to make it. The panel however encourages to stay in constructive dialogue with the Ministry on this issue.

The panel considers it to be very good practice that the university uses its own funds for prolonging the stays abroad of the students. It is very valuable for further enhancement of the English skills, which the panel still recommends to pursue.

4. Examination: System, Policy and Forms

Criterion 4 Exams: System, policy and forms

Evidence:

- Academic Policy, p. 24 ff.
- Module Handbook
- discussion with student

Preliminary assessment and analysis of the peers:

The exam regulations are stipulated partly in the Academic Policy, but the detailed overview of the foreseen examination types is presented in the module handbook. The topics of exams are listed in the syllabi of the respective courses so that students can start preparing for exams in advance. It provides all in all a very good base for looking up expected contents and the exam topics foreseen.

There is are intermediate exams comparable to the one applied in Master's degree programmes: the intermediate controls, taking place in the 7th and 15th week of every term, consisted of validating the submitted homeworks and/or short tests on the relevant course content. Possible forms are additional written or oral testing, assessment of submitted summaries and analytical articles. The panel understands that the university needs to monitor the learning progress of the students; however, the pedagogical added value of interim exams as such on the PhD-level has however not become clear to the panel. PhD students already have a high level of independent learning behaviour, and these

measures would rather just cause inflexibility and take time from the PhD research activities without really helping to keep up with the programme. Thorough monitoring of the students' workload should therefore take place.
Previous to taking the defense, the student must take a final written and oral exam on the mandatory courses from the curriculum. This procedure can be defined internally by every university.

The defense procedure is conducted as follows: every year, several Higher Education Institutions apply for the call for holding a "PhD committee in Physics", and the Ministry of Education and Science decides where the committee will convene. This committee is responsible for the defense procedure. Twelve professors from different fields and universities are selected in order to conduct the defense which is a mixed form of disputation and rigorosum. This committee compiles the final report on the thesis, in addition to the evaluation of the two evaluations by the supervisors. The last step is the approval of the decision by the Ministry. In seldom cases (and not yet in Physics) the last decision on the defense was negative. In case of subject-related reasons, there is the right to retake the PhD defense. In cases of proven plagiarism a retake is not possible.

The programme is concluded by the state exam not later than 3 months before the study programme is officially finished. The exam consists of practical and explanatory (i.e. theoretical) tasks and focuses on the command of methodology and analytical skills. The state exam commission is set up from professors and employer's representative. The mark awarded for the exam, the review of the thesis as well as the mark for the defense constitute the final grade of the student, which the panel deemed to be a good practice for ensuring a broad assessment of the level of knowledge, skills and competencies.

The panel however deemed the fact that the students can chose the examination form for themselves as not beneficial for the successful achievement of the learning outcomes. The free choice does not guarantee that for instance the intended ability to communicate "the major tenets of their field and their work orally and in writing for students, peers and the lay public" or "both fundamental concepts of physics and details of their own research effectively, in written and oral form, to expert and non-expert audiences", as it was stated in the intended learning outcomes of the programmes Physics and Astronomy and Technical Physics (and in comparable form for all programmes) is assessed during the run of the programme. Only in the PhD programme Material Science and New Material Technology, in the module "Nuclear Magnetic Resonance", the examination form is stated as "writing, oral" which however does not enable last clarity about the examination form – is it either oral or written, both, and who decides what form will be applied. Certainly, given that these classes are rather held as colloquia with free discussions in very small groups, the communication with a specialized public in small settings is surely fostered. However, especially as preparation for the defense, it would be helpful to practice presenting in bigger settings, in front of bigger and mixed audiences. The university could think of evaluating the presentations held during student's conferences (or other conferences), and further encourage students to practice the ability of public speeches.

Therefore the examination form should be clearly defined in the module handbooks and syllabi and adjusted to the contents of the module. If the module is focusing on methodology, a practical task with a concrete problem to solve would be more appropriate than an oral exam checking only the theoretical knowledge. It is therefore a clear necessity to revise the policy of arbitrary examination form, and align the exams to the module objectives and contents. Further on, the interim testing methodology should be carefully reviewed in light of its necessity, suitability for assessing the intended learning outcomes and related risk of high workload. At least, it should be monitored constantly and changed when overload is detected.

Final assessment of the peers after the comment of the Provider regarding criterion 4:

The university stated that the main idea and the concept of the educational process of the Ministry of Education and Science is rather unclear even to the programme managers, so that no clear explanation on the practice of interim exams and traditional mixed examination form (a written draft of a solution to a given question with an oral presentation of it) does not always meet the requirements of the competence-oriented approach. The assessment of the panel therefore remains valid - a thorough revision of the assessment procedures is needed.

5. Resources

Criterion 5.1 Staff

Evidence:

- list of and information about research projects in the self-assessment report
- Staff Handbook
- Discussions with programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:

The panel gained the impression of a very smooth management of the programme not only as far as the teaching activities are concerned, but also the availability of support and advice as well as the access to the relevant research equipment. Nevertheless, as every course is offered at the same time by three or four different professors in order to allow students the free choice of teacher and moreover, also in three languages (Russian, Kazakh and English), a vast number of teachers is needed in order to keep the programmes running with such small cohorts. The university has informed the panel about the fact that the grants allocated for every student allow for hiring additional staff and/or finding ways of reducing the workload foreseen for the administrative work or teaching Bachelor's students. However, for the final assessment by the peers, an overview of typical weekly workload of a professor of the PhD programme is needed as an additional document, including the offer of the guided self-study sessions and all administrative duties connected to the educational activities.

Criterion 5.2 Institutional setting, funding and equipment

Evidence:

- Overview of existing labs in the self-assessment report and on the website….
- Visit of the institute's labs
- Discussion with students
- Discussion with teaching staff

Preliminary assessment and analysis of the peers:

The panel evaluated the institutional setting, the funding situation as well as the equipment available at the campus to be on a very good level. The panel visited such facilities as the National Nanotechnological Laboratory of Open Type, consisting of**:** Laboratory of synthesis of pure materials, Laboratory of Electron Microscopy, Laboratory of nanostructures, Laboratory of optical and electrical research methods, Laboratory of small and wide angle X-ray analysis. There is also a Laboratory Engineering Profile (LEP), concentrating on nanomaterials and composites. A further bigger laboratory group are the Laboratories of Experimental and Theoretical Physics which are subdivided into following lab groups: Department Lab of Theoretical Physics, Lab of Thermophysics, Lab of Plasma Physics, Lab of Solid State Physics, Lab of Electronics and Non-linear Physics, Lab of Nuclear Physics. The students and teaching informed the panel that some further facilities of the Nanotechnological laboratory where distributed in several institutes in different districts of Almaty which are easy to reach and access.

The panel learned that the entrance to the Nuclear Research Institutes but also to the Institute for Astrophysics is restricted for third parties and needs an approval process beforehand. Nevertheless, these permissions are easy to get for the PhD students, given that several of their supervisors work in the respective Institutes and National Laboratories.

The students confirmed that they already know during the set-up of the plan for their research activities, which additional equipment their foreign supervisor can provide, so that they adjust their work plan to logistics beforehand and judge this procedure as good and feasible. The panel valued examples of an experimental thesis partly conducted at the premises of up to three different universities in Kazakhstan and abroad. The panel came to the conclusion that the partnering with other institution, not least the cooperation with the foreign supervisors, assures a smooth run of the research work and is all in all a laudable approach to enabling research connected to usually very expensive and mostly very demanded equipment.

As for online sources, the university provides a good access to key scientific periodicals such as “Science” or “Physical Review” in English Language via its data bases. The students evaluated the number of the English resources as good and sufficient, though they are definitely less that Russian or Kazakh sources. They also indicated that additionally needed literature could be obtained through their supervisors or the resources at the international institutions where they had carried out an internship. Another very laudable initiative is supporting the students with additional funding for literature resources with an amount of $ 500 provided annually.

Despite the above, and with the aim of not having to create provisional and individual solutions but being able offer all students and teaching staff a broad and good accessible base for research, the panel recommends further extending the English language resources.

Further on, the panel recommends thinking of new ways for funding PhD places besides the state grant. Since the industry seemed to be very interested in such graduates, Kazakhstan could embark on implementing the international practice of involving the industry in funding such places. Such projects would fit well in the plans of Kazakhstan strategic plan for education, foreseeing commercialization of research products and results to the industry. Since many Kazakh companies, also those stated in the self-assessment reports, are working in the field of applied sciences, widening the permission for private funding of PhD places would lead to mutual benefit for universities and industry. The panel acknowledges, however, that such a change does not depend on the university but on policy making instances.

Final assessment of the peers after the comment of the Provider regarding criterion 5:

The university provided a very detailed overview of the obligations of teaching staff involved in the programmes which made the teaching workload more comprehensive. However, additional administrative workload, such as obligation of supervision in the dormitories or participation in department councils, meetings etc. is not included, so that the final workload has not become clear. The panel therefore encourages to regularly monitor and revise the workload of teaching staff and where necessary, reduce the administrative workload in order to allow for additional time for research and support activities. The university agreed with the statement of the panel provided in the report, so that the assessment by the panel remains as described. The criterion is herewith fulfilled.

6. Quality Management: Development and Enhancement

Criterion 6.1 Quality assurance & enhancement

Evidence:

- Academic Policy, p. 141 ff.
- Quality Management System presented
- description from the website: http://www.kaznu.kz/en/4828/page/About_Al-Farabi_Kazakh_National_University/Quality_management_system_Strategic_directions_of_QMS_development_/ (as of 25.08.2014)

Preliminary assessment and analysis of the peers:
The programme coordinators informed that panel that there is an ISO 9001 approach for management and administration processes implemented in the whole university since 2003 and being since then re-certified annually.

Concerning different elements of quality in teaching and learning, the university has in place several mechanisms: Firstly, the organizational setting with two supervisors, one from the faculty and one from abroad, aims at ensuring two independent perspectives and evaluation of the work done and therefore fulfills a key requirement for impartiality. Secondly, the continuous enhancement of the laboratories and search for further partnering is a good approach of ensuring an up-to-date academic setting. Thirdly, there is a pre-defined maximum ratio of three PhD-students per supervisor aiming at a close contact and thus quick discovery of problems. Fourthly, there are regular evaluations of the modules and also a specific teachers ranking. The results of this ranking are thoroughly monitored and used for staff motivation (best teachers gain additional boni). The students indicated that they would turn to the head of the respective chairs, the dean, or even the Vice-rector for Academic Issues in case of major deficiencies, which proves that the open-door policy of the university is functioning well.

However, students are not much involved in any quality enhancement processes. For example, the use of student's feedback could be made in a more systematic way, not only depending on individual discussions. Students should also be regularly provided with feedback in what form their proposals have been taken into consideration. Considering the fact that the PhD-programmes are still in the very beginning, the audit team considered quality assurance as sufficient when it depends on a very close student-teacher interaction. Nevertheless, a consistent policy with clearly defined aims, methods and responsibilities is not yet existent and should be developed, ensuring a consistent closing of the feedback loops and further strengthening of the stakeholder involvement. It should be well noted that the methodology chosen does not have to be very complex but should be clearly related to the set targets.

Criterion 6.2 Instruments, data and methods

Evidence:

- Self-assessment reports
- Discussion with programme coordinators and students

Preliminary assessment and analysis of the peers:

The self-assessment reports demonstrated that the university collects relevant data, such as graduate's number, job placement (differentiated by "employed by major/not by major"), and also publication activity. While such a broad data base is in principle commendable, the analysis or comments of the data were missing in the self-assessment reports. As for the programme Material science and new material technology and also Physics, no information on intakes has been provided, arguing that the first cohort will graduate in December 2014 (the intake of the last two years must be recorded, however); in Nuclear Physics, no data/analysis on where and after what period of time the graduates found an employment by major/not by major have been provided; in case of Physics no analysis has been provided why not all committee members voted yes for awarding the PhD title; in case of Physics, no statistics at all have been provided although in the content overview, such chapter is foreseen. In the self-assessment report of the programme Physics and Astronomy, no statistical data have been presented, although several students are currently studying the programme. In the discussions, however, all additional questions of the panel on employability and demand for graduates were answered, partly even by teaching staff, which proves the positive practice of informing the stakeholders on key findings from the statistics' analysis. Overall, the panel has gained the impression that the analysis of the data is being conducted regularly and that the responsible persons are familiar with the key insights.

With regard to the quality assurance methods and tools, students confirmed that they make use of instruments of such as completing the student's surveying tools, direct feedback to the teachers and/or the responsible person for modules for their further development. The panel encouraged further use of the surveying, especially of alumni, since first cohorts have already graduated and can now in the retrospective make better judgments on practical relevance, the adequacy of the academic programme, make some proposals on further development of the modules and also provide additional career mentoring for the younger students. The initiatives already in place are good; the panel encourages the university to further broaden the instruments and methods used.

Final assessment of the peers after the comment of the Provider regarding criterion 6:

The university expressed the willingness to discuss such issues as involving student and alumni into the quality management processes with the university's leadership which would be beneficial for all programmes and agrees on the assessment by the peers. The criterion is considered as fulfilled.

7. Documentation & Transparency

Criterion 7.1 Relevant documents

Evidence:

- Academic Policy as a whole
- Self-assessment reports

Preliminary assessment and analysis of the peers:

The regulations are transparently presented and clearly explained by the "University-wide Academic Policies and Procedures of al-Farabi Kazakh National University" (called here "Academic Policy"). This policy is available in Russian language on the website of al-Farabi-University.

The audit team considers the specific characteristics of the programmes to be adequately defined in the respective documents, especially the self-assessment reports and the module handbooks. The visibility of the programmes to third parties, such as prospective students or interested employers, is treated elsewhere in this report (cf. 1 Formal Information and 2.4 contents).

Criterion 7.2 Certificate upon conclusion

Evidence:

- Example of the leaving certificate

Preliminary assessment and analysis of the peers:

An example of the leaving certificate provided upon conclusion of the programme was not made available to the panel. Such a certificate should contain information on programme's structure, contents and level of the concluded programmes, as well as the learner's individual performance, the calculation of final mark including different weighting regulations for the separate modules.

Therefore the panel requests the submission of such certificate as additional document jointly with the comment of the university on this report. This document is needed for the final assessment of the programme.

Final assessment of the peers after the comment of the Provider regarding criterion 7:

The university has submitted two examples of the leaving certificates (standardized diploma partly in English language, the transcript only in Russian/Kazakh) and has further on stated that the certificates upon conclusion of PhD programmes are issued by the Ministry of Education and Science. The panel deemed the certificate to fulfill the requirements of the criterion 7.2. However, it would encourage to stay in a dialogue with the Ministry in order to facilitate the provision of the Certificate/Transcript additionally in English language also.

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 provider on the previous chapters of this report:

D 1. Sound calculation of the ECTS, stating the participation, preparation and self-study, including electives

D 2. Overview of teaching staff of the PhD programmes, including modules taught, preparation time, guided-self study and other obligations

D 3. Statistics on the PhD programme Physics and Astronomy (at least first cohort)

D 4. Example of the leaving certificate for each programme

E Comment of the Provider (13.10.2014)

The institution provided a detailed statement as well as additional documents on the following issues:

1. Statement on the re-calculation (conversion) of Kazakh credits into ECTS
2. The overview of the teaching staff work load for each PhD programme
3. Leaving certificate – Diploma and the transcript (transcript available in Russian/Kazakh only)

F Summary: Peer recommendations (27.10.2014

Taking into account the additional information and the comments given by Kazakh National University named after al-Farabi the peers summarize their analysis and **final assessment** for the award of the ASIIN certificate as follows:

PhD Programme	**ASIIN Certificate**	**Maximum duration of certification**
Material science and new material technology	awarded with requirements	11.11.2019
Nuclear Physics	awarded with requirements	11.11.2019
Physics and Astronomy	awarded with requirements	11.11.2019
Technical Physics	awarded with requirements	11.11.2019
Physics	awarded with requirements	11.11.2019

Requirements

For all PhD Programmes:

A 1. (ASIIN C Seal 2.1) The learning outcomes must be accessible to all stakeholders, including prospective students, potential employers and any interested party. The publication of the learning outcomes on the website and not in the internal documents is required.

A 2. (ASIIN C Seal 2.4) It is necessary to update, complement and continuously monitor the quality of the module handbooks: the missing module descriptions of Research Seminars (all programmes) and internship should be included. The module handbook should also include a sound explanation of the calculation of the student workload.

A 3. (ASIIN C Seal 3.2) A clear and transparent calculation, based on students workload and not on teacher’s workload, is absolutely necessary for due implementation of the programme and thorough monitoring of the workload.

A 4 (ASIIN C Seal 4) There must be a clearly defined examination form for every module, which corresponds to the module objectives and allows for their achievement (competence-oriented examination approach). The practice of interim testing should be carefully monitored in order to avoid student's overload without a considerable added value for their learning success.

Recommendations

For all programmes:

E 1. (ASIIN C Seal 2.4) It is recommended to include into curricula modules targeted on the development of professional overarching skills, such as specialized English skills, modules on successful publication strategies, or modules on scientific writing adequate to PhD level.

E 2. (ASIIN C Seal 3.1) It is recommended to enable as much individual approach to the academic programme as possible. The HEI should further increase the number of electives in order to allow for as much customization to individual needs of students as possible.

E 3. (ASIIN C seal 3.1) The panel recommends allowing for more flexibility as far as publication practice is concerned – once the paper is accepted for publication, but not yet published due to internal processes of the journal, there should be no obstacle for the defense procedure anymore.

E 4. (ASIIN C Seal 3.3) The panel recommends encouraging students to write scientific papers in English, which would help to increase the international visibility of the University.

E 5. (ASIIN C Seal 5.2) The panel recommends further increasing the number of international journals.

E 6. (ASIIN C Seal 5.2) The panel recommends considering further cooperation with industry and other third parties as possible source of new funding for additional PhD vacancies. Since the industry needs highly qualified Physicist, this approach could help to further develop the programmes and the funding sources.

G Decision of the Certification Committee (11.11.2014)

Assessment and analysis for the award of the ASIIN Certificate:

The Certification Committee discussed the procedure and the proposed requirements and recommendations. They noted that one of their tasks was to ensure consistency in the decision-making among the different certification procedures. Thus, they decided that some requirements and recommendations needed to be transferred, deleted or edited for each of the procedures.

Accordingly, they made amendments to the requirements and recommendations. In particular, they emphasized that the award of ECTS credit points was not mandatory for PhD programmes. However, if Al-Farabi University wishes to transfer its national Kazakh credit point system into ECTS, the calculation must be both consistent and in line with the ECTS Users' Guide. Additionally, the committee members considered it reasonable that credits would be awarded to the taught components, not for the research components or associated dissemination outputs.

They furthermore made amendments to requirements 1 and 2 so that these would include only the objectives of the requirement, not any further explanations about their necessity. Similarly, requirement 4 was re-worded to make it more transparent. The part of the requirement which dealt with the practice of interim testing was turned into a recommendation, stipulating that the effectiveness and usefulness of this practice would be monitored before possibly being abolished.

The recommendations regarding students' capability of writing and publishing in English language as well as the corresponding, necessary access to literature, journals and databases in English were summarized and aligned with the wording of other clusters.

PhD Programme/Course/Module	ASIIN Certificate	Maximum duration of certification
Material science and new material technology	awarded with requirements awarded without requirements suspended rejected	31.12.2019 (upon fulfillment of requirements)
Nuclear Physics		31.12.2019 (upon fulfillment of requirements)

PhD Programme/Course/Module	ASIIN Certificate	Maximum duration of certification
Physics and Astronomy		31.12.2019 (upon fulfill-ment of requirements)
Technical Physics		31.12.2019 (upon fulfill-ment of requirements)
Physics		31.12.2019 (upon fulfill-ment of requirements)

The Certification Committee decides to award the ASIIN certificate as follows:

PhD Programme/Course/Module	ASIIN Certificate	Maximum duration of certification
Material science and new material technology	awarded with require-ments awarded without require-ments suspended rejected	31.12.2019 (upon fulfill-ment of requirements)
Nuclear Physics		31.12.2019 (upon fulfill-ment of requirements)
Physics and Astronomy		31.12.2019 (upon fulfill-ment of requirements)
Technical Physics		31.12.2019 (upon fulfill-ment of requirements)
Physics		31.12.2019 (upon fulfill-ment of requirements)

Requirements

For all PhD programmes

A 1. (ASIIN 2.1) The learning outcomes must be accessible to all stakeholders, including prospective students, potential employers and any interested party.

A 2. (ASIIN 2.4) It is necessary to update, complement and continuously monitor the quality of the module handbooks: the missing module descriptions of Research Seminars (all programmes) and internship should be included.

A 3. (ASIIN 3.2) If ECTS credits are used, the transformation of the Kazakh credit points into ECTS must correspond to the ECTS regulations that one credit point is awarded for 25-30 hours student workload and be in line with the Users' Guide. ECTS should be applied for taught parts of the programmes only.

A 4. (ASIIN 4) The exam method must be determined by the staff member at the beginning of the semester and must be adequate to verify the achievement of the intended learning outcomes.

Recommendations

For all PhD programmes

E 1. (ASIIN 2.4, 3.1) For the purpose of conducting research the accessibility of relevant international journals, databases and literature should be improved and made transparent to all teaching staff and students.

E 2. (ASIIN 3.1) It is recommended to ensure that the required publications and the admission to the defense of the thesis and the conferral of the PhD degree are better harmonized in order to avoid undue delays.

E 3. (ASIIN 5.2) The panel recommends considering further cooperation with industry and other third parties as possible source of new funding for additional PhD vacancies.

E 4. (ASIIN 4) The practice of interim testing should be carefully monitored in order to avoid student's overload without a considerable added value for their learning success.