ASIIN Accreditation Report

Bachelor's Degree Programme and Master's Degree Programme
Nuclear Physics
Technical Physics
Physics and Astronomy
Materials science and Technology of New Materials

Provided by
al-Farabi Kazakh National University

Version: 01.07.2016

Table of Content

A About the Accreditation Process

Title of the degree Programme	Labels applied for [1]	Previous ASIIN accreditation	Involved Technical Committees (TC)[2]
Bachelor of Science - Nuclear Physics	ASIIN seal	n/a	05, 13
Master of Science – Nuclear Physics	ASIIN seal	n/a	05, 13
Bachelor in Technics and Technologies - Technical Physics	ASIIN seal	n/a	05, 13
Master in Technics and Technologies - Technical Physics	ASIIN seal	n/a	05, 13
Bachelor of Physics and Astronomy – Physics and Astronomy	ASIIN seal	n/a	05, 13
Master of Physics and Astronomy – Physics and Astronomy	ASIIN seal	n/a	05, 13
Bachelor of technical science – **Materials science and Technology of New Materials**	ASIIN seal	n/a	05, 09, 13
Master of Engineering and Technology – Materials science and Technology of New	ASIIN seal	n/a	05, 09, 13

[1] ASIIN Seal for degree programmes;

[2] TC: Technical Committee for the following subject areas: TC 05 – Physical Technologies, Materials and Processes; Architecture; TC 09 – Chemistry; TC 13 – Physics.

Materials			
Date of the contract: 20.09.2013 **Submission of the final version of the self-assessment report:** 17.02.2014 **Date of the onsite visit:** 07.-08.07.2014 **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			
Representatives of the ASIIN headquarter: Mila Zarkh			
Responsible decision-making committee: ASIIN accreditation commission			
Criteria used: European Standards and Guidelines as of 2009 (third edition) ASIIN General Criteria, as of 17.04.2013 Subject-Specific Criteria of Technical Committee 05 – Physical Technologies, Materials and Processes as of 13.02.2012 Subject-Specific Criteria of Technical Committee 09 – Chemistry as of 13.02.2012 Subject-Specific Criteria of Technical Committee 13 – Physics as of 13.02.2012			

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 Degree Programmes

a) Name & Final Degree	b) Areas of Specialization	c) Mode of Study	d) Duration & Credit Points	e) First time of offer & Intake rhythm	f) Number of students per intake	g) Fees
Bachelor of technical science – 5B071000 – Material science and new material technology	Scientific-research activities (e.g. quantum mechanics, renewable, nuclear physics); Industrial and Technological activities; Expert and Design activities	Full time	8 semester – 228 ECTS/152 Kazakh Credit Points	Since fall 2000, starting annually	110-120 per semester (since 2011/2012: 60-70 per semester)	650.000 kzt/ ca. 2.600 €
Master of Engineering and Technology – 6M071000 – Material science and new material technology	Control Methods; Material science of photovoltaic devices; Semiconductors; Space materials; Technology; Ground-based modeling studies and test systems test	Full time	4 semester – 88,5 ECTS/59 Kazakh Credit Points	Since fall 2011, starting annually	15 - 20 per semester	750.000 kzt/ ca. 3.000 €
Bachelor of Nuclear Physics – 5B060500 – Nuclear Physics	Nuclear Physics, Theoretical Physics, Plasma Physics	Full time	10 semesters – 310 ECTS/186 Kazakh Credit Points	Since April 2004, starting annually in the fall term	30 - 40 per semester	325.000 kzt/ ca. 1.300 €
Master of Nuclear physics – 6M060500 – Nuclear Physics	Influence of Ionizing Radiation on Biological Cells, Radiation medicine	Full time	4 semesters – 99 ECTS/59 Kazakh Credits Points	Since April 2004, starting annually in the fall term	10 - 20 per semester	600.000 kzt/ ca. 2.400 €

Bachelor of Science – 5B061100 – Physics and Astronomy	Astrophysics; Observational Astrophysics; Theoretical Astrophysics; Plasma-Astrophysics	Full time	8 semesters - 226 ECTS/151 Credit Points	Since September 2004, starting annually	50 -60 per semester	500.000 kzt/ ca. 2.000€
Master of Science – 6M061100 – Physics and Astronomy	Astrophysics; Observational Astrophysics	Full time	4 semesters - 88 ECTS/ 59 Kazakh Credit Points	Since September 2006, starting annually	10 - 20 per semester	650.000 kzt/ ca. 2.600€
Bachelor of Technics and Technology – 5B072300 – Technical Physics -	Applied Thermal Physics; Radio Equipment; Nuclear Physics	Full time	8 semesters – 252 ECTS/51 Kazakh Credit Points	Since September 2000, starting annually	40 – 50 per semester	650.000 kzt/ ca. 2.600€
Master of Technics and Technology - 6M072300 – Technical Physics	Technical Physics in Heat Energy; Technical Physics of thermal processes	Full time	4 semesters – 98 ECTS/59 Kazakh Credit points	Since September 2000, starting annually	Ca. 10 students per semester	650.000 kzt/ ca. 2.600€

For the Bachelor's degree programme "Material sciences and new material technology" the self-assessment report states the following **intended learning outcomes**:

"I Knowledge

- Advanced materials and production technology;
- Characterisation of materials structure and properties
- The microstructure and properties of advanced materials;
- The relationships between processing,
- The design and operation of processes to engineer materials with advanced properties;
- The mathematical modelling of processes to engineer materials with advanced properties.

II Understanding

- Can distinguish between and identify the microstructure of metals, ceramics, polymers, liquid crystals and semiconductors;
- Characterize and select materials for design by evaluating the linkages between material properties, microstructures and processing;
- Understanding of professional and ethical responsibility;

- Understand the impact of engineering solutions in a global/societal context;
- Knowledge of contemporary issues;

III Application

- Ability to use the techniques, skills, and modern tools necessary for engineering practice;
- Solve materials engineering problems. Identify and formulate problems, develop and apply analytical and experimental methods of investigation, identify contributing factors and generate, validate, and evaluate alternative solutions;
- To apply knowledge of mathematics, science and engineering;
- To measure and identify the materials properties appropriate to a specific application (e.g. mechanical, electrical, etc;
- To apply concepts of thermodynamics and kinetics in the process design of materials system in order to produce desired structure and properties;
- To design an appropriate experiment to measure specific engineering properties, using statistical procedures;
- To use statistical design of experiments methodology;
- To describe specific processing techniques for synthesis and modification of materials;
- To demonstrate knowledge of resources and contribution of other disciplines to solving engineering problems.

IV Analysis

- Analyze materials engineering problems using a balance of mathematics, physics and chemistry;
- An ability to solve materials problems for the practice of materials science and engineering to meet desired needs within the constraints posed by economic, environmental, social and safety considerations;
- To analyze results of experiments using appropriate theoretical and empirical models;
- To select appropriate characterization methods and interpret experimental results of materials characterization tools.

V Synthesis

- Can infer and predict materials properties based on knowledge of materials structure;
- To assess needs, formulate problem statement, structure solutions and identify role of materials engineering in solving real-world problems;
- To formulate and address ethical issues which arise in solving engineering problems and in the workplace;
- To make effective formal and informal presentations, in written and oral formats appropriate to a specific audience;
- To demonstrates effective interpersonal communication skills;

- To demonstrates knowledge of environmental impacts of chemicals and processes used in materials processing;
- Can document the life cycle/disposal requirements of various types of materials;
- To describe the role of materials in recyclability and materials-efficient design;
- To conduct an information search through library and Internet;
- To recognizes when further knowledge in a subject area is required to accomplish goals;
- Demonstrates resourcefulness in discovering alternative ways of locating information.

VI Evaluation

- To evaluate and select appropriate materials and processing methods based on desired performance;
- Can critically evaluate and apply available information;
- Participates actively in professional society;
- Demonstrates in at least one project the materials issues relevant to current technological problems;
- Contributes actively to service, professional, educational or civic organizations;
- Can demonstrate proper and safe use of specific analytical tools;
- Demonstrates proper and safe use of specific property measurement tools (e.g. electrical test, mechanical properties).“

The intended learning outcomes are published in the student’s guide (print version) as well as in the web-based education management tool called UNIVER (personal log-in data needed, available at univer.kaznu.kz).

The following **curriculum** (short overview for the structure plus detailed curriculum) is presented:

Bachelor of Technical Sciences - Material science and new material technology	State compulsory module – 11 credits (16,5 ECTS) Social and communicative module – 4 credits (6 ECTS) Block vocational modules – 115 credits (172,5 ECTS) Additional type of education – 12 credits (18 ECTS)

Title of modules	Course code	**Title of courses**	Credit	**ECTS/ hours units**	**Lec/prac/ Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (10 credits)	HK 1101	History of Kazakhstan	3	5/135	2+1+0	1
	K(R)LPP 1102	Kazakh (Russian) Language for Professional Purposes	3	5/135	0+3+0	1
	FLPP 1103	Foreign Language for Professional Purposes	3	5/135	0+2+1	1
3. Vocational Modules (115 credits)	**3.1 Natural science(STEM)module**					
	ITPC1301	Information technology for professional communication	**3**	5/135	0+1+2	1
	BM 1304	Basics of Materials science	**3**	5/135	2+1+0	1
	HM1302	Highmathematics	**3**	5/135	1+0+2	1
Semester 2						
3. Vocational Modules (115 credits)	**3.2. BasicProfessionalModules**					
	Module 1 «Mechanics»					
	Meh1401	Механика	3	5/135	2+1+0	2
	PhWM 1402	Physics Workshop onMechanics	2	3/90	0+0+2	2

	Module 5 «Mathematics»					
	MA1409	Mathematical analysis	2	3/90	0+1+1	2
	CVF 1410	Complex variable functions	2	3/90	0+1+1	2
	Module 6					
	DGES 1412	Descriptive geometry and engineering the schedule	**3**	5/135	0+1+2	2
	VBG 1413	Vector and bitmap gra-phics	3	5/135	0+1+2	2
	Module 12 «Chemistry»					
	GCh 1422	General Chemistry	3	5/135	1+1+1	2
4. Prac-tice	EP101	Educational practice	2	2		
6. Addi-tional Types ofLearning	FK	Physical Training	8	12/360	0+0+2	1,2,3, 4
Semester 3						
2. Social andComm unicative Mod-ule(4credi ts)	PhIC 2201	Psychologyof interpersonal communication	2	3/90	1+1+0	3
	TAPS2202	Theoreticaland AppliedPolitical Science	2	3/90	1+1+0	3
	EPSS2203	Ethicsof personal andsocial success	2	3/90	1+1+0	3
	CR2204	Culture and religion	2	3/90	1+1+0	3
	GAS2205	General andApplied Sociology	2	3/90	1+1+0	3
	HS2206	Human safety	2	3/90	1+1+0	3
	ESD2207	Environment and Sustainable Development	2	3/90	1+1+0	3
	KL2208	Kazakh law	2	3/90	1+1+0	3

	BE2209	Basicsofeconomics	2	3/90	1+1+0	3
3. Vocational Modules (115 credits)	**3.2. Basic professional module**					
	Module 2 «MolecularPhysics»					
	MF2403	MolecularPhysics	3	5/135	2+1+0	3
	PhWMP 2404	Physics Workshop on Molecular Physics	2	3/90	0+0+2	3
	Module 5 «Mathematics»					
	IDE1411	Integral and Differential Equations	2	3/90	0+1+1	3
	Module 12 «Chemistry»					
	CChPhChM 2423	Colloidalchemistry and physical andchemical mechanics	3	5/135	1+0+2	3
	Module 13 «Organic chemistry and biochemistry»					
	OH2424	Organicchemistry	3	5/135	1+1+1	3
Semester 4						
1. State Compulsory Module (10 credits)	PhSK2104	The philosophyof scientific knowledge	2	3/90	1+1+0	4
3. Vocational Modules (115 credits)	**3.2. Basic professional module**					
	Module 3 «Electricity»					

	EM2405	Electricity and Magnetism	3	5/135	2+1+0	4
	Ele2406	Electrical Engineering	3	5/135	1+1+1	4
	Module 7 « Mechanical properties and standardization»					
	MPM 2414	Mechanical properties of materials	3	5/135	1+2+0	4
	SM2415	Standardization and Metrology	2	3/90	1+1+0	4
	Module 13 «Organic chemistry and biochemistry»					
	Bio2425	Biochemistry	3	5/135	1+1+1	4
	3.4 Interdisciplinary module					
	IE2601	Innovative entrepreneurship(by industry)	2	3/90	1+1+0	4
	IPL2602	Intellectual property law	2	3/90	1+1+0	4
	FLPC2603	Foreign Language for professional communication	2	3/90	0+2+0	4
	MNDCM2604	Methods of nondestroying control of materials,	2	3/90	1+1+0	4
	Bio2605	Bionanotechnology	2	3/90	1+1+0	4
	NM2606	NanotechnologyinMaterials	2	3/90	1+1+0	4
4. Practice	PT202	Practice training	2	4		
Semester 5						
3. Vocational Modules (115 credits)	**3.1 Natural science(STEM)module**					

	Bio 3303	Biophysics.	3	5/135	2+1+0	5
	3.2. Basic professional module					
	Module 4 «Optics»					
	Opt3407	Optics	3	5/135	2+1+0	5
	PWO3408	Physics Workshop onOptics	3	5/135	0+1+2	5
	Module 8 «Basics of Design»					
	DME 3416	Details ofMachine Elements	3	5/135	2+1+0	5
	ADE 3417	AutocadDesignEditor	3	5/135	0+1+2	5
	Module 10 «PhysicalMaterialScience»					
	PhMS 3420	PhysicalMaterialScience	3	5/135	1+2+0	5
Semester 6						
3. Vocational Modules (115 credits)	**Module 9 «Manufacturing Engineering»**					
	ME 3418	Manufacturing Engineering.	3	5/135	2+1+0	6
	TEPM 3419	Technological equipment of production materials	3	5/135	2+1+0	6
	Module 11 «Physical properties of materials»					
	PPM 3421	Physical properties of materials	3	5/135	2+1+0	6
	3.3 Modules individual educational trajectories					

	(IET)					
	IET 1 **Scientific - research activities**	**IET 2** **Industrial and technologicalactivities**	**IET 3** **Expert-ly and design activi-ties**			
	BQMAP3502 The basics of quantummechanics and atomic physics 2+1+0	APhS3502 Atomic physics and spectroscopy 2+1+0	APh3502 Atomic physics 2+1+0	3	5/135	
	NPh 3503 NuclearPhysics 2+1+0	NPh3503 NuclearPhysics 2+1+0	NPh 3503 nuclear Mate-rials 2+1+0	3	5/135	
	RES3504RenewableEnergySources 1+1+0	SCMD3504 Semi-conductor materials and devices 1+1+0	RES3504 RenewableEnergy Sources1+1+0	2	5/135	
	SSPh 3505 The Solid State Phys-ics 1+1+1	CMPh 3505 Condensed Matter Physics 1+1+1	SSPh 3505 The Solid State Physics 1+1+1	3	5/135	
4. Prac-tice	PT303	Practice training	2	6		
Semester 7						
3. Voca-tional Modules (115 cred-its)	**3.3 Modulesindividual educationaltrajectories (IET)**					
	IET 1 **Scientific - research**	**IET 2** **Industrial and technologicalactivities**	**IET 3** **Expert-ly**			

	activities		**and design activi-ties**			
	SW4501 Scientific writing (каз/рус/анг) 0+1+0	SW4501 Scientific writing (каз/рус/анг) 0+1+0	SW4501 Sci-entific writing (каз/рус/анг) 0+1+0	1	1.5/45	
	SCMD 3506 Semi-conductor mate-rials and devices 2+1+0	RES3506 RenewableEnergy Sources 2+1+0	FCPh3506 Fun-damentals of crystal physics 2+1+0	3	5/135	
	XRCP3507X-rays and crystal phys-ics. 2+1+0	OD3507 Optoelectronic devices2+1+0	FN3507 Fundamentals of Nanotechnology 2+1+0	3	5/135	
	DM3508 Dielectricmaterials 2+1+0	MPC3508 Materials for photovoltaic cells 2+1+0	Bio3508 Bionanotechnology 2+1+0	3	5/135	
	NCM3509 New and composit materials 2+1+0	DSCP3509 Design of solar cell production. 2+1+0	RMS3509 Radiation Material Sci-ence2+1+0	3	5/135	
	ALM 3510Amorphous and liquid materi-als 2+1+0	ALM 3510Amorphous and liquid materials 2+1+0	ADS3510 Automatic design system	3	5/135	

			2+1+0			
	MM 3511 Metal Materials 1+2+0	PEMSB 3511Process equipment of manufacture of solar batteries 1+2+0	Con3511Construction 1+2+0	3	5/135	
Semester 8						
4. Practice	PT404	Practice training	4	8		
5. Final attestation	EP 401	Writing and defense ofBachelor'sthesis(diploma)	2	3/90		8

As **intended learning outcomes of the Master's degree programme** "Material sciences and new material technology" the institution states:

"I Knowledge

- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current and future developments and technologies.
- A comprehensive understanding of the scientific principles of own specialisation and related disciplines.
- Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems.
- An awareness of developing technologies related to own specialization
- Knowledge of characteristics of particular materials, equipment, processes or products.
- Extensive knowledge and understanding of a wide range of engineering materials and components.

II Understanding

- Understanding of engineering principles and the ability to apply them to analyse key engineering processes;
- Knowledge and understanding of commercial and economic context of engineering processes;
- Understanding of the requirement for engineering activities to promote sustainable development;

- Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, etc.);
- Understanding use of technical literature and other information sources.
- to understand conceptually organized system of physical and chemical sciences and to use the knowledge in creative problem solving in the curriculum , teaching methods, scientific activities;
- Possession of information technologies, modern equipment and sophisticated equipment for scientific research;

III Application

- Process and change the blank, prepared food, parts and products for various branches of engineering and technology (mechanical engineering and instrument making, aviation and space technology, nuclear power, solid-state electronics, nanotechnology, medical equipment, etc.);
- Find the standards and other regulations in the evaluation, quality control and certification of new products;
- Prepare documents for patenting and design know-how;
- Calculate the production cost of production of a product, to identify the cost;
- Pick up at a certain job specific electrical and electronic devices, expect to operate them;
- Maintain and troubleshoot production equipment, which is used in the manufacture and processing of materials;
- Assess the technical possibilities of production plants and equipment;
- Assess the technical and environmental security on the job site;
- The formation of scientific research, technical or scientific and methodological programs enterprises, scientific research organization, department, laboratory or participate in shaping the research agenda of higher rank;
- Development of new methods and techniques of research -based knowledge of the methodology of scientific research and the specific problem to be solved;
- Modeling of new types and kinds of materials and coatings model study, the theoretical analysis and experimental verification of theoretical data;
- Modeling, research and experimental verification of theoretical data in the development of new processes of production, processing and recycling of materials and coating;
- The organization, program development and implementation of comprehensive laboratory and testing of materials, semi-finished products, parts and coatings;
- Conducting literature and patent search professional set problem, documentation on the results of the innovation process and the protection of intellectual property;
- Implementation of a technical report (or partition) on the results of research, training of scientific and technical material for publication;
- The ability to use conceptual and methodological knowledge in materials science and related sciences to perform custom tasks at different levels of complexity;

- Ability to conduct research in the field of communication, apply professional knowledge and practical skills teaching physics and chemistry in schools with the use of modern computer technology, interactive teaching methods;
- Ability to work in international, international research teams, to be politically correct in any non-standard situations;

IV Analysis

- To select, define and solve problems arising in the course of the research and educational activities that require in-depth professional knowledge;
- choose appropriate research methods, modify existing, and develop new methods, based on the specific purpose of research;
- to choose the priorities of educational and research activities, to the correlation of self-interest with social and ethical values, as well as the interECTS of the team in the field of communication;
- represent the results of the work done in the form of reports, essays, articles, designed in accordance with your requirements, using modern means of editing and printing;
- analysis of the current state of science and technology in the field of training areas;
- develop new programs and research topics, to justify the methodology of scientific and technological development and material science;
- to develop new methods and techniques of research materials and processes, methods and tools of standard and non-standard tests;
- develop theoretical models of materials and coating processes, to organize an experimental verification of theoretical data to produce prototypes of materials, parts, develop new processes of production, processing and recycling of materials and coating, to create new types of production tools , methods and control the quality of products;
- organize the development and implementation of comprehensive programs of laboratory research and testing of materials, semi-finished products , parts and coatings;
- conduct literature and patent search problem posed by materials science and technology of new materials, documentation on the results of the innovation process and the protection of intellectual property;

V Synthesis

- to generalize and systematize the scientific information to obtain new scientific evidence in the field of physics;
- to integrate knowledge, to make judgments on the basis of incomplete or limited information, based on ethical and social responsibility for the use of these opinions and knowledge;
- to develop research projects, acquisition of new knowledge and innovation into practice. 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 product
- 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

- Working knowledge of the scientific team, the ability to implement communication in scientific and professional work, self-improvement and self-development for a successful career;
- The capacity for social interaction and collaboration to address the scientific / technical / technological industry to self-development and social adaptation in situations related to improving the capacity to correct, tolerant and productive cooperation in the society;
- The capacity for decision-making and participation in their implementation, the manifestation of contingency personal interECTS with the needs of production and society;
- Skills in preparing scientific projects and organizational skills to implement them and solve practical problems;
- The ability to study for scientific research or other acquisition of professional qualifications;
- to apply core concepts in Materials Science to solve engineering problems.
- to select materials for design and construction;
- to design and conduct experiments, and to analyze data;
- understand the professional and ethical responsibilities of a materials scientist and engineer;
- to work both independently and as part of a team;
- to communicate effectively while speaking, employing graphics and writing;
- possess the skills and techniques necessary for modern materials engineering practice;

- participation in the work of a multidisciplinary group of experts in carrying out comprehensive studies or tests;
- Participation in research and innovation."

The following **curriculum** (short overview plus detailed curriculum) is presented:

Master of Technical Sciences - Material science and new material technology	State compulsory module - 8 credits (12 ECTS) Compulsory Professional Modules - 14 credits (23 ECTS) Modules of Individual Educational Paths - 20 credits (33 ECTS) Additional types of Training – 17 credits (25,5 ECTS)

Title of modules	Course code	**Title of courses**	Credit	**ECTS/ hours units**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (10 credits)	IFN 5201	History and Philosophy of Science	2	3/90	1+1+0	1
	Iya(p)5202	Foreign language (Professional)	2	3/90	1+1+0	1
Compulsory Professional Modules - 14 credits	NOVM5205	Scientific Bases of the Choice of Materials	2	3/90	1+1+0	1
	OPNI 5206	Organization and Planning of Scientific Research	3	5/135	2+1+0	1
	FHPM5207	Physics and chemistry of polymer-ic materials	3	5/135	2+1+0	1
	SM5208	Modern Material Science	3	5/135	2+1+0	1
Additional Types of Training	**Master's Reseach Work and Fullfilment of Dis-sertation**					
	NIRM I	Research Seminar I	1	1.5/45		1
	Professional Practice					
	IP	Research practice	1	1.5/45		1
Semester 2						
2. State Compulsory Module (10 credits)	Ped 5203	Pedagogics	2	3/90	1+1+0	2
		Psychology	2	3/90	1+1+0	2

Compulsory Professional Modules - 14 credits	ONM5209	Fundamentals of Nanotechnology in Materials	3	5/135	2+1+0	2
Modules of Individual Educational Paths - 20 credits	**Total Materials**					
	Control Methods					
	MYRV 5301	Non-Destructive Testing of Materials	2	3/90	1+1+0	2
	KSA 5302	Crystal Physics and Structural Analysis	2	3/90	1+1+0	2
	Environment					
	MKS 5303	Metal Condensed Mediums	2	3/90	1+1+0	2
	DKS 5304	Dielectric Condensed Mediums	2	3/90	1+1+0	2
Modules of Individual Educational Paths - 20 credits	**Materials Science photovoltaic devices**					
	Semiconductors					
	FPD 5301	Physics of semiconductors and dielectrics	2	3/90	1+1+0	2
	PP 5302	Semiconductors	2	3/90	1+1+0	2
	Types of devices					
	TKFTU 5304	The heatcollector, photovoltaicand thermoelectric devices	2	3/90	1+1+0	2
	TPEVE 5303	Technical Principles Energy-saving and Renewable Power	2	3/90	1+1+0	2
	Space Materials					
	Space Physics					
	5301	Factors of space	2	3/90	1+1+0	2
	5302	Physical conditions in near-Earth space	2	3/90	1+1+0	2

	Nanomaterialsin space technology					
	6303	Physical basis of silicon-nanomaterials	2	3/90	1+1+0	2
	6304	Carboncompositenanomaterials	2	3/90	1+1+0	2
Additional Types of Training	**Master's Reseach Work and Fullfilment of Dissertation**					
	NIRM II	Research Seminar II	1	1.5/45		2
Semester 3						
Modules of Individual Educational Paths - 20 credits	**Total Materials**					
	Materials					
	RM 6305	radiation Materials	3	5/135	2+1+0	3
	ASM 6306	Amorphous and Glassy Materials	3	5/135	2+1+0	3
	Technology					
	FTIPP 6307	Physics and Manufacturing Techniques of Semi-conductor Devices	3	5/135	2+1+0	3
Modules of Individual Educational Paths - 20 credits	TOPM 6308	Process Equipment of Manufac-ture Materials	3	5/135	2+1+0	3
	Materials Science Photovoltaic Devices					
	Technology					
	KM 6305	materials of Construction	3	5/135	2+1+0	3
	TPPPMP 6306	Technological processes for the production of semiconductor materials and devices	3	5/135	2+1+0	3
	Technology of Photovoltaic Devices					
	TPPNFM 6307	Technological processes for the production of photovoltaic mod-ules and teplokollektornyh	3	5/135	2+1+0	3
	TOPSM6308	Process equipment manufacture of solar modules	3	5/135	2+1+0	3
	Space Materials					
	Dynamics of theradiation nvironmentof outer space					
	6305	Radiation conditions on the orbits of spacecraft	3	5/135	2+1+0	3

	6306	Space vehiclesf or different purposes	3	5/135	2+1+0	3
	Ground-basedmodeling studiesand testsystems test					
	6307	Modellingterrestrialstudies of the propertiesof structural materials	3	5/135	2+1+0	3
	6308	Testing complexes	3	5/135	2+1+0	3
Additional Types of Training	**Master's Reseach Work and Fullfilment of Dissertation**					
	NIRM III	Research Seminar III	1	1.5/45		3
	Professional Practice					
	PP	Pedagogical Practice	3	5/135		3
Semester 4						
Additional Types of Training	**Doctoral Student's Reseach Work[3] and Fullfilment of Dissertation**					
	NIRM IV	Research Seminar IV	4	6/180		4
	Professional Practice					
	IP	Research practice	2	3/90		4
Final Attestation	KE	Complex Examination	1	1.5/45		4
	ZD	Dissertation Fullfilment and Defence	3	5/135		4

As **intended learning outcomes of the Bachelor's and Master's degree programme** "Nuclear Physics" the institution states:

" I. Knowledge

1. Know the basic laws of nuclear physics, Nuclear Physics and 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

[3] Here, the master thesis is meant.

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

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

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 Physicsto 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

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

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

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 (short overview plus detailed curriculum) for the Bachelor's programme:

Bachelor of Science in Nuclear Physics	• State Compulsory Module -10 Kazakh credits=450hours (17 ECTS) • Social and Communicative Module -4 Kazakh credits=315 hours =7 ECTS

	• Vocational Modules-149 Kazakh credits=6705 hours =248 ECTS • Modules for Individual Educational Trajectories (IET)- *35* Kazakh credits =1575hours =58 ECTS • Interdisciplinary Module-*8* Kazakh credits=360 hours = 13 ECTS • Internship (Academic and industrial); • Final Certification

Name of modules		Discipline code	Names of disciplines (modules) and types of activities	CP KAZ	ECTS/ hours	Lec/ prac/ Lab.	Sem
	1. State Compulsory Module (10 credits)	HRK 1101	History of the Republic of Kazakhstan	2	3/90	1+1+0	1
		L(R)LPP 1102	Kazakh (Russian) Language for Professional Purposes	3	5/135	0+3+0	1
		FLPP 1103	Foreign Language for Professional Purposes	3	5/135	0+2+1	1
		PSK 1104	Philosophy of Scientific Knowledge	2	3/90	1+1+0	4
	2. Social and Communicative Module (4 credits)	PIC 2201	Psychology of Interpersonal Communication	2	3/90	1+1+0	2
		TAPS 2202	Theoretical and Applied Political Science	2	3/90	1+1+0	2
		EPSS 2203	Ethics of Personal and Social Success	2	3/90	1+1+0	2
		CR 2204	Culture and Religion	2	3/90	1+1+0	2
		GAS 2205	General and Applied Sociology	2	3/90	1+1+0	2
		HLS 2206	Human Life Safety	2	3/90	1+1+0	2
		ESD 2207	Ecology and Sustainable Development	2	3/90	1+1+0	2
		FE 2208	Fundamentals of Economics	2	3/90	1+1+0	2
		KL 2209	Kazakh Law	2	3/90	1+1+0	2
	3. Vocational Modules (149 credits)	**3.1 Natural Sciences (STEM) module**		**12**	**18/540**		
		ITPP 1301	Information Technologies for Professional Purposes	3	5/135	1+0+2	1
		MA 1302	Mathematicsl Analysis 1.	3	5/135	2+1+0	1
		NRNP 5303	Nuclear Reactors and Nuclear Power	3	5/135	2+0+1	9
		RBNM	Radiation Biophysics and	3	5/135	2+1+0	6

		3304	Nuclear Medicine				
		3.2. Basic Professional Modules		***98***	**147/4 410**		
			Module 1 Physics 1				
		GCPM 1401	General Course of Physics. Mechanics	3	5/135	2+1+0	1
		PPM 1402	Physics Practicum on Mechanics	2	3/90	0+0+2	1
		GCFMP 1403	General Course of Physics. Molecular Physics	3	5/135	1+1+1	2
		PPMP 1404	Physics Practicum on Molecular Physics	2	3/90	1+0+1	2
			Module 2 Physics 2				
		GCPEM 2405	General Course of Physics. Electricity and Magnetism	3	5/135	2+1+0	3
		PPEM 2406	Physics Practicum on Electricity and Magnetism	2	3/90	0+0+2	3
		GCPO 2407	General Course of Physics. Optics	4	6/180	2+1+1	4
		GCPFRPE 2408	General Course of Physics. Fundamentals of Radio Physics and Electronics	3	5/135	1+1+1	4
			Module 3 Physics 3				
		CMP 3409	Condensed Matter Physics	3	5/135	1+1+1	5
		GCPAP 3410	General Course of Physics. Atomic Physics	3	5/135	2+1+0	5
		PPAP 3411	Physics Practicum on Atomic Physics	2	3/90	0+0+2	5
		NP 4412	Nuclear Physics	3	5/135	2+1+0	7
			Module 4 Mathematics				
		MA 1413	Mathematicsl Analysis 2.	3	5/135	2+1+0	2

		AGLA 1414	Analytic Geometry and Linear Algebra	2	3/90	1+1+0	2
		DE 2415	Differential Equations	3	5/135	2+1+0	3
		TFCV 2416	The Theory of Functions of Complex Variables	3	5/135	2+1+0	4
		IC 2417	Integral Calculus	3	5/135	2+1+0	4
			Module 5 Methods of Theoretical Physics				
		MTFBVTA 2418	Methods of Theoretical Physics. Part 1. Basics of Vector and Tensor Analysis.	2	3/90	1+1+0	2
		MTFMMP 3419	Methods of Theoretical Physics. Part 2. Mathematicsl Methods in Physics.	3	5/135	2+1+0	5
			Module 6 Theoretical Physics				
		TPM 2420	Theoretical Physics. Part 1. Mechanics.	3	5/135	2+1+0	3
		TPE 2421	Theoretical Physics. Part 2. Electrodynamics.	3	5/135	2+1+0	4
		TPQM 3422	Theoretical Physics. Part 3. Quantum Mechanics	4	6/180	2+2+0	5
		TPTSP 3423	Theoretical Physics. Part 4. Thermodynamics and Statistical Physics	3	5/135	2+1+0	6
			Module 4 Nuclear Physics				
		IPANEP 3424	Introduction to the Physics of Atomic Nucleus and Elementary Particles	4	6/180	2+1+1	6
		PPNP 4425	Physics Practicum on Nuclear Physics	2	3/90	0+0+2	7
		NRD 4426	Nuclear Radiation Detectors	3	5/135	2+0+1	7
		IRM	The Interaction of Radiation	3	5/135	2+0+1	8

		4427	with Matter				
			Module 4 Theory of Nuclear Reactions				
		TNR 4428	The Theory of Nuclear Re-actions	3	5/135	2+1+0	8
		ST 4429	Scattering Theory	3	5/135	2+1+0	8
		AP 5430	Accelerator Physics	3	5/135	2+0+1	9
		KNR 5431	Kinematics of Nuclear Reactions	3	5/135	2+1+0	9
			Module 5 Chemistry				
		Chem 2432	Chemistry	3	5/135	1+1+1	3
			Module 6 Pedagogy and Psychology				
		MTP 4433	Methods of Teaching Physics	2	3/90	1+1+0	7
		Ped 4434	Pedagogy	2	3/90	1+1+0	7
		Psy 4435	Psychology	2	3/90	1+1+0	7
		3.3 Modules for Individual Educational Trajectories (IET)		**35**	58/1575		

			IET 1 Nucle-ar Physics	IET 2 Theoretical Physics	IET 3 Plasma Physics			
			SW3501 Sci-entific writing kaz/rus/eng 0+1+0	**SW3501** Scien-tific writing (kaz/rus/eng) 0+1+0	**SW3501** Scien-tific writing (kaz/rus/eng) 0+1+0	***1***	1.5/45	5
			CSPP	**CMTP 3502**	**CSPP**	***2***	3/90	5

			3502 Com-puter Simu-lation of Physi-cal Pro-cesses 1+0+1	Computer Modeling in Theoretical a Physics 1+0+1	**3502** Com-puter Simula-tion in Plasma Physics 1+0+1				
			GUIAE 3503 Graph-ical User Inter-faces and Auto-mation of the Exper-iment 1+0+2	**QTS 3503** Quantum Theory of Scattering 2+1+0	**ISP 3503** The Iono-sphere and Space Plasma 2+1+0	***3***	5/135		6
			DPAR 3504 Dosim etry and Protec-tion Agains t Radi-ation 2+1+0	**AMQM 3504** Approximate Methods in Quantum Me-chanics 2+1+0	**NMPP 3504** Numeri-cal Meth-ods in Plasma Physics 2+1+0	***3***	5/135		6
			Ast 3505 Astrop hysics	**PNA 3505** The Problems of Nuclear Astro-physics	**PGD 3505** Physics of the Gas Dis-	***2***	3/90		6

			1+1+0	1+1+0	charges 1+1+0				
			SGT 4506 Symmetry and the Group Theory 2+1+0	**QTAM 4506** Quantum Theory of Angular Momentum 2+1+0	**FPP 4506** Fundamentals of Plasma Physics 2+1+0	***3***	5/135		7
			NSRW ST 4507 Nuclear Safety and Radioactive Waste Storage Technology 2+1+0	**STR 4507** Special Theory of Relativity 2+1+0	**PDP 4507** Physics of Dusty Plasma 2+1+0	***3***	5/135		7
			TFI 4508 The Theory of Fundamental Interactions 2+1+0	**RQT 4508** Relativistic Quantum Theory 2+1+0	**DPP 4508** The Dielectric Properties of the Plasma 2+1+0	***3***	5/135		8

			FIENP 4509 Formulation and Implementation Experiments in Nuclear Physics 1+0+2	**ITNR 4509** Introduction to the Theory of Nuclear Reactions 2+1+0	**PPP 4509** Physics of Plasma Processes 2+1+0	***3***	5/135		8
			NP 4510 Neutron Physics 2+1+0	**ITN 4510** Introduction to the Theory of Nuclei 2+1+0	**VEI 4510** Vacuum Equipment and Instruments 2+1+0	***3***	5/135		8
			PEP 5511 Physics of Elementary Particles 2+1+0	**MN 5511** Model of Nuclei 2+1+0	**TE 5511** Thermo nuclear Energy 2+1+0	***3***	5/135		9
			TANNM 5512 The Theory of	**QFT 5512** The Quantum Field Theory 2+1+0	**PTF 5512** Physics of Ther-Ther-monucle	***3***	5/135		9

			Atomic Nuclei and Nucle-ar Mod-els 2+1+0		ar Fu-sion 2+1+0				
			Rad 5513 Radiog enesis 2+1+0	**NMQM 5513** Numerical Methods in Quantum Me-chanics 1+1+1	**DNPP 5513** The De-sign of Nuclear Power Plants 2+1+0	***3***	5/135		9
		3.4 Interdisciplinary Module							
		EPP 2601		English for Professional Purposes		2	3/90	0+2+0	3
		FLSTT 2602		Foreign Language. Scientific and Technical Translation		2	3/90	0+1+1	3
		IE 2603		Innovative Entrepreneurship		2	3/90	0+2+0	3
		IPL 2604		Intellectual Property Law		2	3/90	0+2+0	3
	4. Practice	EP 101		Educational		2	3/90		2
		PP 202		Practice Training		2	3/90		4
		PP 303		Practice Training		2	3/90		6
		PP 404		Practice Training		2	3/90		8
		PP 505		Pedagogical Practice		4	6/180		10
	5. Final Certification	WPB501		Writing and Presentation of Bachelor's thesis (Diploma Project)		2			8
	6. Additional	PT 101		Physical Training		8	13/360	0+0+2	1, 2,

	Types of Learning						3, 4
	TOTAL			**186**			

The **following curriculum** is presented (short overview plus detailed curriculum) for the Master's programme:

Master of Science in Nuclear Physics	• State Compulsory Module – 8 Kazakh credits=360 hours =13 ECTS • Compulsory Professional Modules – 14 Kazakh credits=630 hours =23 ECTS • Modules of Individual Educational Paths – 20 Kazakh credits=900 hours = 33 ECTS • Additional Types of Training -13 Kazakh credits =585 hours =22 ECTS Final Attestation - 4 Kazakh credits =90 hours = 7 ECTS

Name of modules	Discipline code	Names of disciplines (modules) and types of activities	Credit(kazakh)	ECTS/ hours	Lec/ prac /Lab.	Sem
1. State Compulsory Module (10 credits)	IFN 5201	History and Philosophy of science	2	3/90	1+1+0	1
	Iya(p)5202	Foreign language (Professional)	2	3/90	1+1+0	1
	Ped 5203	Pedagogics	2	3/90	1+1+0	2
	Psy 5204	Psychology	2	3/90	1+1 +0	2
2. Compulsory Professional Modules -	MYa 5205	Model of nuclei. P2	2	3/90	1+1 +0	1
	OPNI 5206	Organization and Planning of Scientific Research	3	5/135	2+1 +0	1
	YaRPE 5102	Nuclear reactions at intermediate energies	3	5/135	2+1 +0	1
	FYaR 5103	Physics of Nuclear Reactors	3	5/135	2+1+0	2
	AEYaF 5104	Automatization of Experiment in Nuclear Physics	3	5/135	2+1+0	2
3. Modules of Individual Educational Paths – (20 credits)	YaOV 5301	Nuclear-physical Bases of Influence of Ionizing Radiation on Biological Cells	3	5/135	2+1+0	1
	MLDT 5302	Radiological Techniques and Therapeutic Nuclear Medicine	3	5/135	2+1+0	1

	RG 5303	Radiogenesis	3	5/135	2+1+0	2
	RBYaM 5304	Radiation Biophysics in Nuclear Medicine	3	5/135	2+1+0	2
	DYaM 6305	Dosimetry in Nuclear Medicine	3	5/135	2+1+0	3
	BDI 6306	Biological Effects of Radiation	3	5/135	2+1+0	3
	Rad 6307	Radon Therapy	3	5/135	2+1+0	3
	YaDK 6308	Nuclear Diagnostics in the Clinic	3	5/135	2+1+0	3
4. Additional Types of Learning	NIRM I	Research Seminar I	1	1.5/45		1
	NIRM II	Research Seminar II	1	1.5/45		2
	NIRM II	Research Seminar III	1	1.5/45		3
	NIRM IV	Research Seminar IV	4	6/180		4
	PP	Pedagogical Practice	3	5/135		2
	IP	Research practice	3	5/135		4
5. Final Certification	KE	Complex Examination (1 credit)	1	1.5/45		4
	ZD	Dissertation Fullfilment and Defence (3 credits)	3	5/135		4
TOTAL			**59**			

As **intended learning outcomes of the Bachelor's degree programme** "Physics and Astronomy" the institution states:

"The educational outcomes that our students can expect to derive from the Physics and Astronomy Program are the following:
I Knowledge

- basic concepts, laws and models of general and theoretical physics;
- mathematical tools and mathematical methods used in astronomy and space sciense;
- the basic concepts of astronomy and astrophysics ;
- basics of Radio Physics and Electronics ;
- modern instruments and methods of observation astrometry , astrophysics and space physics , including tools and methods for astronomical observations from space vehicles , the theoretical and practical aspects of space communications ;
- computer-based data collection, storage and processing of information ;
- the theory and methodology of teaching physics and astronomy.

II Understanding

- the main objects, objects and areas of research in astronomy and space physics;
- the main experimental, theoretical and numerical methods for the study of astronomical phenomena and processes;
- the most well-known theories and models of astronomical and space physics phenomena and processes, as well as their practical applications;
- the policy of the state in the field of education and basic educational technologies used in the Republic of Kazakhstan.

Results of training programs

III Application

• *apply* knowledge of the physical sciences, mathematics, and engineering fundamentals to the solution of radio engineering and telecommunications problems.

• *design* and *conduct* experiments in radio engineering and electronics, and to analyze and interpret the data generated by those experiments.

• *design* components, devices, and systems to meet specific needs in radio engineering and electronics.

• *work* effectively on multi-disciplinary teams involving people from diverse backgrounds.

• *identify* and *define* problems in radio and computer engineering, and to generate and evaluate solutions to those problems.

• *understand* the professional and ethical responsibilities incumbent upon the practicing radio engineer.

• *communicate* effectively, both orally and in writing, in the field of radio engineering and electronics.

• *understand* the role and impact of telecommunications in a broader societal and global context.

• *recognize* and *respond* to the need for life-long learning for a successful career in radio engineering, electronics and telecommunications.

• *develop* an understanding of contemporary technical and professional issues in the practice of radio engineering, electronics and telecommunications.

• *use* the techniques, skills, and tools of modern engineering, including the use of computer-based technologies such as programming, use of engineering and business applications, and the use of electronic media, effectively in the practice of radio engineering, electronics and telecommunications.”

The **following curriculum** is presented for the Bachelor’s programme:

Bachelor of Science - Physics and Astronomy	• State Compulsory Module –10 credits(15 ECTS) • Social and Communicative Module – 4 credits (6 ECTS) • Vocational Modules–115 credits (172 ECTS) – Natural Sciences (STEM) Module – 12 credits (18 ECTS) – Basic Professional Modules – 69 credits (103 ECTS) – Modules for Individual Educational Trajectories (IET) – 30 credits (45 ECTS) – Interdisciplinary Module – 4 credits (6 ECTS) • Practice – 12 credits (18 ECTS) • Final examination (Writing and Presentation of Bachelor's thesis (Diploma Project)) – 2 credits (3 ECTS) • Additional Forms of Training – 8 credits (12 ECTS)

Name ofmodules	Disciplinecode	Names of disciplines (modules) and types of activities	Credit	ECTS/hours	Lec/prac/Lab.	Sem.
1. State Compulsory	HRK1101	Historyof the Republic ofKazakhstan	2	3/90	1+1+0	1
	K(R)LPP1	Kazakh(Russian) Language for Profession-	3	5/13	0+3+0	1

Module(10credits)	102	al Purposes		5		
	FLPP1103	Foreign Language for Professional Purposes	3	5/135	0+2+1	1
	PhSK1104	Philosophyof Scientific Knowledge	2	3/90	1+1+0	2
2. Social andCommunicative Module(4credits)	PhIK2201	Psychologyof Interpersonal Communication	2	3/90	1+1+0	3
	TAPS2202	Theoretical and AppliedPolitical Science	2	3/90	1+1+0	3
	EPSS2203	Ethics of Personal and Social Success	2	3/90	1+1+0	3
	CR2204	Culture and Religion	2	3/90	1+1+0	3
	GAS2205	General andApplied Sociology	2	3/90	1+1+0	3
	HLS2206	Human Life Safety	2	3/90	1+1+0	3
	ESD2207	Ecology and Sustainable Development	2	3/90	1+1+0	3
	KL2208	Kazakhstan Law	2	3/90	1+1+0	3
	FE2209	Fundamentals of Economics	2	3/90	1+1+0	3
3. Vocational Modules (115credits)	3.1 Natural Sciences(STEM) module		12			
	ITPP1301	Information Technologies for Professional Purposes	3	5/135	1+0+2	2
	APHM1302	Additional Parts of Higher Mathematics	3	5/135	1+2+0	2
	CMAP1303	Computer Modeling of Astrophysical Processes	3	5/135	1+2+0	2
	PhCC4415	Physics of the condensed condition	3	5/135	1+1+1	7
	3.2. BasicProfessionalModules		69			
		Module 1	*15*			

	GA1304	GeneralAstronomy	3	5/13 5	1+2+0	1
	SA1401	Spherical Astronomy	3	5/13 5	1+2+0	2
	FA2402	Fundamentals of Astrophysics	3	5/13 5	1+2+0	3
	Ast2403	Astrometry	3	5/13 5	1+2+0	3
	CM3404	Celestial Mechanics	3	5/13 5	1+2+0	5
		Module 2	*12*			
	SES4405	The Structure and Evolution of Stars	3	5/13 5	1+2+0	7
	FK4406	Fundamentalsof Cosmology	3	5/13 5	1+2+0	7
	IRA3407	Introduction toRadio Astronomy	3	5/13 5	1+1+1	6
	EGA340 8	ExtragalacticAstronomy	3	5/13 5	1+2+0	6
		Module 3	*21*			
	Meh140 9	Mechanics	3	5/13 5	1+1+1	1
	MPh141 0	Molecular Physics	3	5/13 5	1+1+1	2
	EM2411	Electricityand Magnetism	3	5/13 5	1+1+1	3
	Opt2412	Optics	3	5/13 5	1+1+1	4
	APh2413	Atomic Physics	3	5/13 5	1+1+1	4

	NPh3414	Nuclear physics	3	5/135	1+1+1	5
	FRPhE2416	Fundamentals ofRadio Physics and Electronics	3	5/135	1+1+1	4
		Module 4	*10*			
	TPh12417	Theoretical Physics.Part 1 -Theoretical Mechanics	3	5/135	2+1+0	3
	TPh22418	Theoretical Physics.Part 1 - Methods of mathematical physics	2	3/90	1+1+0	4
	TPh33419	Theoretical Physics.Part 2 – Electrodynamics	3	5/135	2+1+0	5
	TPh43420	Theoretical Physics.Part 3 -Quantum Mechanics	2	3/90	1+1+0	6
		Module 5	*6*			
	MA1421	Mathematical Analysis	3	5/135	1+2+0	1
	DE2422	Differential Equations	3	5/135	1+2+0	3
		Module 6	*5*			
	TMTPhA3423	Theory and Methods of Teaching Physics and Astronomy	3	5/135	1+2+0	6
	Ped2424	Pedagogy	2	3/90	1+2+0	4
	3.3 Modules forIndividual EducationalTrajectories (IET)		30			

		IET 1 Astrophysics	IET 2 ObservationalAstrophysics	IET 3 Theoretical Astrophysics	IET 4 Plasmaastrophysics				
		SW4501 Scientific writing	SW4501 Scientific writing	SW4501 Scientific writing	SW4501 Scientific writing (kaz/rus/eng)	1	1,5/45		5

		(kaz/rus/eng)0+1+0	(kaz/rus/eng) 0+1+0	(kaz/rus/eng) 2+1+0	0+1+0				
		SA3502 Stellar Astronomy 1+2+0	PA3502 PracticalAstrometry 1+2+0	ThA3502 Theoretical Astrophysics 2+1+0	EISP3502 Earth's Ionospherea ndSpace Plasma 1+2+0	3	5/135		5
		PhP3503 Physics ofPlanets 1+1+1	FEA3503 Fundamentalsof Experimental Astronomy 1+1+1	FC3503 Fundamentals ofCosmogony2+1+0	SPPh3503 Solar plasmaphysics1+1+1	3	5/135		5
		PhIM3504 Physicsof Interstellar Medium 1+2+0	SEA3504 Semiconductorelectronicsin astrophysics 1+2+0	CE3504 Cosmical Electrodynamics 2+1+0	APMPPh3504 Actual Problemsof Modern Plasma Physics 1+2+0	3	5/135		5
		HEA3505 Introductionto cosmic rays physics 1+1+1	DSC3505 Digitalsatellite communication1+1+1	ISD3505 Introduction to stellar dynamics 2+1+0	NMSPPh3505 Numerical Methods inSpace Plasma Physics 1+1+1	3	5/135		6
		CR3506 Cosmic Radioemission 1+2+0	FA3506 Fundamentalsof Astrophotometry 1+2+0	IGR3506 Introduction to the Generalrelativity 2+1+0	CSPP3506 Computer Simulation of Plasma Processes 1+2+0	3	5/135		7
		INPh4507 Introductionto Non-	NAS4507 Methods of nonlinear	NPCM4507 Nonstati	PhEOP4507 Physics of the	3	5/135		6

		linear Physics 2+1+0	physics in astrophysics 2+1+0	onary problems of Celestial mechanics2+1+0	Earthand other planets 1+1+1				
		NOG4508 NonstationaryObjects ofGalaxy 1+2+0	SRR4508 Space Radiolacationrand Radionavigation 1+2+0	DSS4508 Dynamics ofthe Solar System 2+1+0	CE4508 Cosmic Electrodynamics1+2+0	3	5/135		7
		PhSSS4509 Physics of the Sunand the Solar System 1+1+1	SMPS4509 Spectral methodsof Planets study 1+1+1	IRA4509 Introduction to RelativisticAstrophysics 2+1+0	PhPAP4509 PhysicsProcessesof Astrophysical Plasma 1+1+1	3	5/135		6
		PhDEDM4510 Physics ofDark Energyand Dark Matter 1+1+0	CTA4510 Computer Technology in astronomy 1+1+0	CMCM4510 Stability of the Motion in Celestial Mechanics 2+1+0	PhGD4510 Physics ofGas Discharge 1+1+0	2	3/90		7
		CMUE4511 Current Models ofUniverse Evolution 2+1+0	IEAAS4511 Information – entropy Analysis ofAstrophysicalSignals 2+1+0	DDNGS4511 Dynamicsof doubleNonstationaryGravitating Systems 2+1+0	SDPAO4511 Spectroscopic Diagnosticsof PlasmaAstrophysical Objects 2+1+0	3	5/135		7

	3.4 InterdisciplinaryModule		4			
	Ie2601	Innovative Entrepreneurship(trade-wise)	2	3/90	1+1+0	4
	IPL2602	Intellectual Property Law	2	3/90	1+1+0	4
	NAAI2603	Nonlinear Analysis ofAstrophysical Information	2	3/90	1+1+0	4
	NA2604	Nanoelectronicsin Astrophysics	2	3/90	1+1+0	4
	IPhOS2605	Introduction to Physicsof Open Sys-tems	2	3/90	1+1+0	4
4. Practice	EP101	Educational Practice	2	3/90		2
	PT202	Practice Training	1	1,5/ 45		4
	PP403	Pedagogical Practice	5	5/22 5		8
	PT304	Practice Training	2	3/90		6
	PT404	Practice Training	2	3/90		8
5. Final Certificati on	PPBD401	Preparation and Presentation ofBachelor's Dissertation (Diploma Project)	2	3/90		8
6.Additio nal Types ofLearnin g	PT	Physical Training	8		0+0+2	1, 2, 3, 4
TOTAL			151			

As **intended learning outcomes of the Master's degree programme** "Physics and Astronomy" the institution states:

"I Knowledge

- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in astronomical disciplines, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current and future developments and technologies.

- A comprehensive understanding of the scientific principles of own specialisation and related disciplines.
- Knowledge and understanding of mathematical principles necessary to underpin their education in astronomical disciplines and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of astronomical problems.
- An awareness of developing technologies related to own specialization
- Extensive knowledge and understanding of a wide range of modern astronomical and physical problems.

II Understanding

- Understanding of mathematical principles and the ability to apply them to analyse key astronomical and physical phenomens;
- Understanding of the requirement for physical activities to promote sustainable development;
- Understanding of contexts in which astronomical knowledge can be applied (e.g. operations and management, technology development, etc.);
- Understanding use of technical literature and other information sources.
- to understand conceptually organized system of physical and astronomical sciences and to use the knowledge in creative problem solving in the curriculum , teaching methods, scientific activities;
- Possession of information technologies, modern equipment and sophisticated equipment for scientific research;

Results of training programs

III Application

- Find the standards and other regulations in the evaluation, quality control and certification of new products;
- Prepare documents for patenting and design know-how;
- Pick up at a certain job specific electrical and electronic devices, expect to operate them;
- Assess the technical possibilities of astronomical production equipment;
- The formation of scientific research, technical or scientific and methodological programs enterprises, scientific research organization, department, laboratory or participate in shaping the research agenda of higher rank;
- Development of new methods and techniques of research based knowledge of the methodology of scientific research and the specific problem to be solved;
- Modeling of astronomical and physical phenomens, the theoretical analysis and experimental verification of theoretical data;
- Modeling, research and experimental verification of theoretical data in the field of astronomy and physics;

- Conducting literature and patent search professional set problem, documentation on the results of the innovation process and the protection of intellectual property;
- Implementation of a technical report (or partition) on the results of research, training of scientific and technical material for publication;
- The ability to use conceptual and methodological knowledge in physical and astronomical sciences and related sciences to perform custom tasks at different levels of complexity;
- Ability to conduct research in the field of communication, apply professional knowledge and practical skills teaching physics and astronomy in schools with the use of modern computer technology, interactive teaching methods;
- Ability to work in international, international research teams, to be politically correct in any non-standard situations;

IV Analysis

- To select, define and solve problems arising in the course of the research and educational activities that require in-depth professional knowledge;
- choose appropriate research methods, modify existing, and develop new methods, based on the specific purpose of research;
- to choose the priorities of educational and research activities, to the correlation of self-interest with social and ethical values, as well as the interECTS of the team in the field of communication;
- represent the results of the work done in the form of reports, essays, articles, designed in accordance with your requirements, using modern means of editing and printing;
- analysis of the current state of science and technology in the field of training areas;
- organize the development and implementation of comprehensive programs of laboratory research and testing of materials, semi-finished products , parts and coatings for astronomical purpose;
- conduct literature and patent search problem posed by astronomy and physics, documentation on the results of the innovation process and the protection of intellectual property;

V Synthesis

- to generalize and systematize the scientific information to obtain new scientific evidence in the field of physics;
- to integrate knowledge, to make judgments on the basis of incomplete or limited information, based on ethical and social responsibility for the use of these opinions and knowledge;
- to develop research projects, acquisition of new knowledge and innovation into practice.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 product for astronomical purpose
- 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
- Working knowledge of the scientific team, the ability to implement communication in scientific and professional work, self-improvement and self-development for a successful career;
- The capacity for social interaction and collaboration to address the scientific / technical / technological industry to self-development and social adaptation in situations related to improving the capacity to correct, tolerant and productive cooperation in the society;
- The capacity for decision-making and participation in their implementation, the manifestation of contingency personal interECTS with the needs of production and society;
- Skills in preparing scientific projects and organizational skills to implement them and solve practical problems;
- The ability to study for scientific research or other acquisition of professional qualifications;
- to apply general math, science and engineering skills to the solution of astronomical problems;
- to apply core concepts in physical science to solve astronomical problems.
- to select materials for design and construction astronomical technics;
- to design and conduct experiments, and to analyze data;
- understand the professional and ethical responsibilities of a scientist and engineer;
- to work both independently and as part of a team;
- to communicate effectively while speaking, employing graphics and writing;
- possess the skills and techniques necessary for modern physical practice;
- participation in the work of a multidisciplinary group of experts in carrying out comprehensive studies or tests;
- Participation in research and innovation.”

The **following curriculum** is presented for the Master's programme Physics and Astronomy:

Master of Science - Physics and Astronomy	• Compulsory State Modules – 8 credits (12 ECTS0) • Compulsory Professional Modules– 14 credits (21 ECTS) • Modules of Individual Educational Paths – 20 credits (30 ECTS) • Master's Research Work and Fulfillment of Dissertation – 7 credits (10,5 ECTS) • Final Attestation – 4 credits (6 ECTS)

Name of modules	Names of disciplines (modules) and types of activities		Credit	ECTS/hours	Lec/prac/Lab.	Sem
Compulsory State Modules – 8 credits	1.1.	History and Philosophy of Science	2	3/90	1+1+0	1
	1.2.	Foreign language (Professional)	2	3/90	1+1+0	1
	1.3	Pedagogics	2	3/90	1+1+0	2
	1.4	Psychology	2	3/90	1+1+0	2
Compulsory Professional Modules – 14 credits	2.1.	Organization and Planning of Scientific Research	3	5/135	2+1+0	1
	2.2.	Physics of Stars	2	3/90	1+1+0	1
	2.3.	Dynamic Chaos in Astrophysics	3	5/135	2+1+0	1
	2.4.	Experimental methods for Astrophysics	3	5/135	2+1+0	1
	2.5.	Methods of teaching physics in high school	3	5/135	2+1+0	2

		IET 1 Astrophysic	IET 2 Obser-vation al As-trophy sics	20			
Modules of Indi-vidual Education-al Paths – 20 credits	3.1.	Information technology and computerization of research	Semi-con-ductor elec-tronics and optoe-lectron ics in astro-nomic al ob-servati ons	3	5/135	2+1+0	2
	3.2.	Nonlinear analysis of as-tronomical data	Observ ational techni ques of astron omy, astron omical Databa se	2	3/90	1+1+0	2
	3.3.	Nonlinear discrete models of spiral Galaxies	Sto-chastic models of spi-ral Galax-ies	3	5/135	2+1+0	3
	3.4.	Mass of Galaxies and fractal measure	Not addi-tive entro-py of astro-physi-	2	3/90	1+1+0	3

			cal signals				
	3.5.	Solar radio	Fractal a metrics for astrophysical signals	3	5/135	2+1+0	3
	3.6.	Active galaxies	Fractal measures in a problem of a dark matter and dark energy	2	3/90	1+1+0	3
	3.7.	Extragalactic astronomy and cosmology	Microcontrollers in radio astronomy	3	5/135	2+1+0	3
	3.8.	Cosmology and particle physics	Nanotechnological light filters in astrophysics	2	3/90	1+1+0	2
Professional Practice – 6 credits	4.1.	Pedagogical Practice	3	5/135		3	
	4.2.	Research practice	3	5/135		1,4	
Master's Reseach	5.1.	Preparation and imple-	7	9/315		4	

Work and Fullfilment of Dissertation – 7 credits		mentation of the master's thesis					
Final Attestation – 4 credits	6.1.	Complex Examination	1	1,5/45		4	
	6.2.	Dissertation Fullfilment and Defence	3	5/135		4	
TOTAL:	59 credits						

As **intended learning outcomes of the Bachelor's degree programme** "Technical Physics" the institution states:

"Upon completion of the Technical Physics Bachelor of Technics and Technologies Program, graduates are expected to attain the following outcomes:

I. **Knowledge**

Knowledge
1. Know the content, significance and economic substance of the current program
2. Own a culture of thinking, he knows its general laws, to be capable of writing and speaking correctly (logical) to issue its results
3. Have knowledge of basic professional relationship and management principles with regard to technical, financial and human factors
4. Know how to use the problem-solving methods , determining the optimal links between the parameters of different systems
5. The basis of the legal system and laws of the Republic of Kazakhstan in the field technics

II. Understanding

Understanding
1. Understand the nature and social significance of the future profession
2. Understand the basic problems of disciplines that define a specific area of student's activities, see their relationship in a holistic system of knowledge
3.Advanced concepts of fundamental sciences and engineering to identify, formulate and solve complex heat power engineering problems
4.Understand contemporary issues and research opportunities/challenges related to energy and sustainability and engage in lifelong learning in the field and in the fundamentals of other related disciplines

Results of training programs

5. Application

Application
1. Possession of a wide range of knowledge in all areas of physics: the use of physical instruments
2. Possession of computer methods of calculation and simulation
3. Implementation of mathematical modeling and optimization of the parameters of objects by means of developed and available funds research and design, including standard and specialized software packages
4. Develop mathematical models of industrial heat and power systems and their elements, write the software for the use of mathematical models as a research tool
5. Apply the methods of analysis, synthesis and optimization of processes
6. Develop the technical documentation

6. Analysis

Analysis
1. Formulate the objectives of the project (program), identify priorities for solving problems
2. Use computer technology for processing the results of measurements, use the methods of standardization and certify products
3. Develop and use the automated experiment conduction
4. Modeling and optimize of technological processes, facilities
5. Computerization of administrative and economic problems
6. Calculate and analyze the flow of liquids and gases and heat transfer, calculate heat exchangers
7. Analysis and synthesis of automatic control

7. The synthesis

the synthesis
1. Identify and address current and future heat power engineering problems related to energy sources, generation, conversion, transmission, utilization, efficiency, protection, and control;
2. Find a compromise between the different requirements (to cost, quality, safety and terms of performance) for both long-term and short-term planning
3. Design, calculate and control of systems of energy production and distribution
4. Develop a program plan for internal control and audit
5. Formulate the objectives of the project (program), identify priorities for solving problems;
6. Apply a multi-disciplinary approach to conceive, plan, design, and implement solutions to problems in the field of technical physics
7. Organize conferences, debates, special courses and round-table discussions on issues in the field of technicas and technical physics
8. Use an advanced approach to design and conduct experiments, and to analyze and interpret data
9. Propose and choose optimal scientific methods of learning to achieve goals
10. Communicate effectively in written and oral form, both, individually and as a member of a multidisciplinary team, and thus to put forward the scientific findings at national and international levels successfully

8. evaluation

Evaluation
1. Evaluate ways to use modern engineering tools necessary for the application of engineering and technology.
2. Estimate the value of technical and scientific research, service to society, leadership and life-long learning required to further their career aspirations
3. Assess productive and non-productive costs for providing a high level of product quality to meet international standards
4.Assessment of the ability to identify, formulation and solution of engineering problems.
5. Evaluate the impact of solutions to energy problems in a global, economic, environmental, and societal context

The **following curriculum** is presented:

Bachelor of Science - Technical Physics (5B072300)	• State Compulsory Module - 10 credits (17 ECTS) • Social and Communicative Module - 4 credits (7 ECTS) • Vocational Modules - 115 credits (192 ECTS): • Natural Sciences (STEM) Module - 12 credits (20 ECTS); • Basic Professional Modules - 69 credits (115 ECTS); • Modules for Individual Educational Trajectories (IET) - 30 credits (50 ECTS); • Interdisciplinary Module - 4 credits (7 ECTS) • Internship (Academic and industrial) – 12 credits (20 ECTS); • Additional types of learning - 8 credits (14 ECTS); • Final Certification - 2 credits (4 ECTS);

Title of mod-ules	Course code	**Title of courses**	**Credit**	**ECTS/ hours**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
1. State Compulsory Module (10 credits)	HRK1101	History of the Republic of Kazakhstan	2	3/90	1+1+0	1
	K(R)LPP1102	Kazakh (Russian) Language for Profes-sional Purposes	3	5/135	0+3+0	1
	FLPP1103	Foreign Language for Professional Pur-poses	3	5/135	0+2+1	1
2. Vocational Modules (115 credits)	**3.1. Natural Sciences (STEM) module** (6 credits)		**12**			
	Pr1301	Programming	3	5/135	1+0+2	1
	Mat1302	Mathematics	3	5/135	1+2+0	1
	3.2. Basic Professional Modules		**69**			
		Module 1. Mechanics				
	Mech1401	Mechanics	3	5/135	2+1+0	1
	PWMF1402	Physics Workshop on Mechanics	3	5/135	0+1+2	1
6. Additional types of lear-ning	PhT	Sport and Recreation	2	3/90	0+0+2	1
Semester 2						
1. Vocational	**3.1. Natural Sciences (STEM) module** (6 credits)		**12**			

Modules (115 credits)	Chem1303	Chemistry	3	5/135	1+1+1	2
	3.2. Basic Professional Modules		**69**			
		Module 2. Molecular Physics				
	MPh1403	Molecular Physics	3	5/135	2+1+0	2
	PWMP1404	Physics Workshop on Molecular Physics	3	5/135	0+1+2	2
		Module 7. Foundations of Mathematics				
	MA1413	Mathematical analysis	3	5/135	1+2+0	2
	AGLA1414	Analytical Geometry and Linear Algebra	2	3/90	1+1+0	2
		Module 14. Protection of Labour and safety at enterprises				
	LP1425	Labor Protection	2	3/90	1+1+0	2
4. Internship	EP101	Educational Internship	2	3/90		2
6. Additional Types of Lear-ning	PhT	Sport and Recreation	2	3/90	0+0+2	2
Semester 3						
2. Social and Communicative Module (4 credits)	PIC2201	Psychology of Interpersonal Communi-cation	2	3/90	1+1+0	3
	TAPS2202	Theoretical and Applied Political Science	2	3/90	1+1+0	3
	EPSS2203	Ethics of Personal and Social Success	2	3/90	1+1+0	3
	CR2204	Culture and Religion	2	3/90	1+1+0	3
	GAS2205	General and Applied Sociology	2	3/90	1+1+0	3
	HLS2206	Human Life Safety	2	3/90	1+1+0	3
	ESD2207	Ecology and Sustainable Development	2	3/90	1+1+0	3
	KL2208	Kazakhstan Law	2	3/90	1+1+0	3
	FE2209	Fundamentals of Economics	2	3/90	1+1+0	3
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**		**69**			
		Module 3. Electricity and Magnetism				
	EM2405	Electricity and Magnetism	3	5/135	2+1+0	3
	PWEM2406	Physics Workshop on Electricity and Magnetism	3	5/135	0+1+2	3
		Module 8. Mathematical Equations				
	DIE2415	Differential and Integral Equations	2	3/90	1+1+0	3
		Module 9. Professional Foreign Lan-guage				
	FLBP2417	Foreign Language. Basics of profession-al cummunication	3	5/135	0+3+0	3
		Module 10. Methods of Theoretical Physics				
	FVTA2418	Fundamentals of Vector and Tensor Analysis at the Theoretical Physics	2	3/90	1+1+0	3
	MMP2419	Methods of Mathematical Physics	2	3/90	1+1+0	3

<table>
<tr><td>6. Additional Types of Lear-ning</td><td>PhT</td><td colspan="2">Sport and Recreation</td><td>2</td><td>3/90</td><td>0+0+2</td><td>3</td></tr>
<tr><td colspan="8">Semester 4</td></tr>
<tr><td>1. State Compulsory Module (10 credits)</td><td>PSK1104</td><td colspan="2">Philosophy of Scientific Knowledge</td><td>2</td><td>3/90</td><td>1+1+0</td><td>4</td></tr>
<tr><td rowspan="16">3. Vocational Modules (115 credits)</td><td colspan="3">3.1. Natural Sciences (STEM) module (6 credits)</td><td>12</td><td></td><td></td><td></td></tr>
<tr><td>ARE 2304</td><td colspan="2">Alternative and Renewable Energy</td><td>3</td><td>5/135</td><td>1+1+1</td><td>4</td></tr>
<tr><td colspan="3">3.2. Basic Professional Modules</td><td>69</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Module 4. Optics</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Opt2407</td><td colspan="2">Optics</td><td>3</td><td>5/135</td><td>2+1+0</td><td>4</td></tr>
<tr><td>PPWO2408</td><td colspan="2">Physics Workshop on Optics</td><td>3</td><td>5/135</td><td>0+1+2</td><td>4</td></tr>
<tr><td></td><td colspan="2">Module 8. Mathematical Equations</td><td></td><td></td><td></td><td></td></tr>
<tr><td>TCV2416</td><td colspan="2">The Theory of Complex Variable</td><td>2</td><td>3/90</td><td>1+1+0</td><td>4</td></tr>
<tr><td></td><td colspan="2">Module 9. Professional Foreign Lan-guage</td><td></td><td></td><td></td><td></td></tr>
<tr><td>FLBP2417</td><td colspan="2">Foreign Language. Basics of profession-al cummunication</td><td>3</td><td>5/135</td><td>0+3+0</td><td>4</td></tr>
<tr><td></td><td colspan="2">Module 12. Measurement Procedure</td><td></td><td></td><td></td><td></td></tr>
<tr><td>MPTM2422</td><td colspan="2">Metrology and Physical and Technical Measurements</td><td>3</td><td>5/135</td><td>1+0+2</td><td>4</td></tr>
</table>

<table>
<tr><td>6. Additional Types of Lear-ning</td><td>PhT</td><td colspan="2">Sport and Recreation</td><td>2</td><td>3/90</td><td>0+0+2</td><td>4</td></tr>
<tr><td>4. Internship</td><td>EP101</td><td colspan="2">Educational Internship</td><td>2</td><td>3/90</td><td></td><td>4</td></tr>
<tr><td colspan="8">Semester 5</td></tr>
<tr><td rowspan="11">3. Vocational Modules (115 credits)</td><td colspan="3">3.2. Basic Professional Modules</td><td>69</td><td></td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Module 5. Atomic Physics</td><td></td><td></td><td></td><td></td></tr>
<tr><td>APh 3409</td><td colspan="2">Atomic physics</td><td>3</td><td>5/135</td><td>2+1+0</td><td>5</td></tr>
<tr><td>PWAPh3410</td><td colspan="2">Physics Workshop on Atomic physics</td><td>3</td><td>5/135</td><td>0+1+2</td><td>5</td></tr>
<tr><td></td><td colspan="2">Module 11. Theoretical Physics</td><td></td><td></td><td></td><td></td></tr>
<tr><td>EQM3420</td><td colspan="2">Electrodynamics and Quantum Mechanics</td><td>3</td><td>5/135</td><td>1+2+0</td><td>5</td></tr>
<tr><td colspan="3">3.3 Module’s for Individual Educational Trajectories (IET)</td><td>30</td><td></td><td></td><td></td></tr>
<tr><td>IET 1. Applied Thermal Physics</td><td>IET 2. Radio Equipment</td><td>IET 3. Nuclear Physics</td><td>30</td><td></td><td></td><td></td></tr>
<tr><td>PhEC3502 Physics of Energy Conservation
1+ 1+1</td><td>CMP3502 Condensed-matter Physics
1+ 1+1</td><td>EEEM 3502 Engineering Ecology and Environmental Management
1+ 1+1</td><td>3</td><td>5/135</td><td></td><td>5</td></tr>
<tr><td>CSTP3503 Computer Simulation of Thermophysical Prob-lems</td><td>TSI3503 Transfer and Security of Information
1+ 1+1</td><td>FED 3503 Fundamentals of Engineering Drawing</td><td>3</td><td>5/135</td><td></td><td>5</td></tr>
</table>

	1+ 1+1		1+ 1+1				
	MCAP3504 Methods of Calculation of Aerohydrodynamic Plants 2+1+0	PFSE3504 Physical Foundations of Solid State Electronics 2+1+0	CMD3504 A Computerized Mechanical Design 2+1+0	3	5/135		5
Semester 6							
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**			**69**			
		Module 6. Nuclear Physics					
	NPh3411	Nuclear physics		3	5/135	2+1+0	6
	PWNP3412	Physics Workshop on Nuclear physics		3	5/135	0+1+2	6
		Module 13. Thermophysical Problems					
	PRGL3423	Physics of a real gas and liquid		2	3/90	1+0+1	6
	3.3 Module's for Individual Educational Trajectories (IET)			**30**			
	IET 1. Applied Thermal Physics	**IET 2. Radio Equipment**	**IET 3. Nuclear Physics**	**30**			
	TPM3505 Thermophysical Properties of Matters under Low Temperatures 1+1+1	SE3505 Semiconductors Electronics 1+1+1	NEM 3505 Nuclear Electronics and Microprocessors 1+1+1	3	5/135		6
	CHME3506 Convective Heat-mass Exchange 1+1+1	CDE3506 Chaotic dynamics in electronics 1+1+1	GUIAE 3506 Graphical User Interfaces and Automation of the Experiment 1+1+1	3	5/135		6
	3.4. Interdisciplinary module			4			
	FLST3601	Foreign Language. Scientific and Technical Translation		2	3/90	0+1+1	6
	FLSP3602	Foreign Language for Special Purposes		2	3/90	0+1+1	6
	IE3603	Innovative Entrepreneurship (tradewise)		2	3/90	0+2+0	6
	IPL3604	Intellectual Property Law		2	3/90	0+2+0	6
4. Internship	PT303	InternshipTraining		2	3/90		6
Semester 7							
3. Vocational Modules (115 credits)	**3.2. Basic Professional Modules**			**69**			
		Module 11. Theoretical Physics					
	TSM4421	Thermodynamics and Statistical Mechanics		2	3/90	1+1+0	7
		Module 13. Thermophysical Problems					
	VF4424	Viscous flow		2	3/90	1+0+1	7
	3.3 Module's for Individual Educational Trajectories (IET)			**30**			
	IET 1. Applied Thermal Physics	**IET 2. Radio Equipment**	**IET 3. Nuclear Physics**	**30**			
	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	SW4501 Scientific writing (kaz/ru/eng) 0+1+0	1	1.66 /45		7
	PCE4507 Physics of	CSAE4507 Com-	NRD 4507	3	5/13		7

	Combustion and Explosion 1+1+1	puter Simulation of Analog Electronic Systems 1+1+1	Nuclear Radiation Detectors 1+1+1		5		
	PTPS4508 Plasma Technology in Power System 1+1+1	CCE4508 Computer Circuit Engineering 1+1+1	NSRWST 4508 Nuclear Safety and Radioactive Waste Storage Technology 1+1+1	3	5/13 5		7
	AE4509 Applied Thermal Physics 1+1+1	PLIC4509 Programmable logic integrated circuits 1+1+1	FIENP 4509 Formulation and Implementation Experiments in Nuclear Physics 1+1+1	3	5/13 5		7
	CrC4510 Cryoengineering and Cryotechnology 1+2+0	DE4510 Digital Electronics 1+2+0	DPATPP 4510 Design Principles of Atomic and Thermonuclear Power Plants 1+2+0	3	5/13 5		7
	SRFCC4511 3D Simulation of Reacting Flows in Combustion Chambers 1+1+0	OE4511 Optoelectronics 1+1+0	APEA 4511 Automation Physics Experiments at Accelerators 1+1+0	2	3/90		7
Semester 8							
4. Internship	PT404	InternshipTraining		6	10/2 70		8
5. Final certification	PPBD40 1	Preparation and Presentation of Bachelor's Dissertation (Diploma Project)		2	3/90		8

As **intended learning outcomes of the Master's degree programme** "Technical Physics" the institution states:

"The graduate of the Technical Physics Bachelor 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**

Knowledge
1. The basis of the legal system and laws of the Republic of Kazakhstan in the field of technics and technical physics
2. Be able to plan and carry out pilot studies and create on their basis of experimental facilities;
3. Optimal methods of work organization research - research groups in the study, processing and manufacturing of devices and appliances that meet the requirements and standards of the market;
4. Rules and standards for design, construction, installation and operation of equipment
5. Methods of design, construction, installation and operation of technical equipment
6. The requirements of standardization, metrology and ensure life safety in the design and operation of power system devices
7. Methods of theoretical and experimental research in the field of technics and technical physics

2. Understanding

Understanding
1. Understand the nature and social significance of the future profession
2. Understand the basic problems of disciplines that define a specific area of student's activities, see their relationship in a holistic system of knowledge
3.Advanced concepts of fundamental sciences and engineering to identify, formulate and solve complex heat power engineering problems
4.Understand contemporary issues and research opportunities/challenges related to energy and sustainability and engage in lifelong learning in the field and in the fundamentals of other related disciplines
5. Basic principles and methods of research, development and production of materials, components and devices, technical physics, defined profile for Master's
6. Element base devices and systems
7. Understanding the fundamental principles of the unity of physics

Results of training programs

1. Application

Application
1. Possession of a wide range of knowledge in all areas of physics: the use of physical instruments
2. Possession of computer methods of calculation and simulation
3. Implementation of mathematical modeling and optimization of the parameters of objects by means of developed and available funds research and design, including standard and specialized software packages
4. Develop mathematical models of industrial heat and power systems and their elements, write the software for the use of mathematical models as a research tool
5. Apply the methods of analysis, synthesis and optimization of processes
6. Develop the technical documentation

2.Analysis

Analysis
1. Formulate the objectives of the project (program), identify priorities for solving problems
2. Use computer technology for processing the results of measurements, use the methods of standardization and certify products
3. Develop and use the automated experiment conduction
4. Modeling and optimize of thermal technological processes, facilities
5. Analyze manufacturing and financial activities at heat power plants, computerization of administrative and economic problems
6. Calculate and analyze the flow of liquids and gases and heat transfer, calculate heat exchangers
7. Analysis and synthesis of automatic control
8. Distinction between scientific tools used in thermal engineering problems in the field of energy and sustainability.
9.Techno-economic analysis of developments in the field of research

3. The synthesis

the synthesis
1. Formulate the objectives of the project (program), identify priorities for solving problems;
2. Develop a program plan for internal control and audit
3. Find a compromise between the different requirements (to cost, quality, safety and terms of performance) for both long-term and short-term planning
4. Organize conferences, debates, special courses and round-table discussions on issues in the field of technical and technical physics
5. Use an advanced approach to design and conduct experiments, and to analyze and interpret data;
6. Propose and choose optimal scientific methods of learning to achieve goals

7.Communicate effectively in written and oral form, both, individually and as a member of a multidisciplinary team, and thus to put forward the scientific findings at national and international levels successfully

4.Evaluation

Evaluation
1. Estimate the value of technical and scientific research, service to society, leadership and life-long learning required to further their career aspirations;
2. Technical and economic calculation of alternative options for production, introduction of new techniques and technologies, and modernization of facilities
3. Assess productive and non-productive costs for providing a high level of product quality to meet international standards
4. Assessment of progress in computer technology related to engineering
5. Evaluate the impact of solutions to energy problems in a global, economic, environmental, and societal context.
6. Ability to evaluate the results of a comprehensive research project

The **following curriculum** is presented:

Master of Science - Technical Physics (6M072300)	• Compulsory State Module - 8 credits - (13 ECTS) • Compulsory Professional Modules - 14 credits (23 ECTS) • Modules of Individual Educational Paths - 20 credits (33 ECTS)

Title of modules	Course code	**Title of courses**	**Credit**	**ECTS/ hours**	**Lec/prac/Lab.**	**Sem.**
Semester 1						
1. Compulsory State Modules - 8 credits		**Compulsory State Module 1**				
	IFN 5201	History and Philosophy of Science	2	3/90	1+1+0	1
	IYa(p)5202	Foreign language (Professional)	2	3/90	0+2+0	1
		Compulsory State Module 2				
	Ped 5203	Pedagogics	2	3/90	1+1+0	1
	Psy 5204	Psychology	2	3/90	1+1+0	1
2.Compulsory Professional Modules - 14 credits		**Compulsory Professional Module 1**				
	TRZh 5205	Thermal Physics of Rheological Fluids	3	5/135	1+2+0	1
		Compulsory Professional Module 2				
	OPNI 5206	Organization and Planning of Scientific Research	3	5/135	2+1+0	1
		Compulsory Professional Module 5				
	MNNS 5209	Methods of writing scientific articles	2	3/90	1+1+0	1
3. Modules of Individual Educational Paths - 20 credits		**6M072301 – Technical Physics in Heat Energy**				
	MTRP 5301	Methods of Thermal Physics Calculation and Project of Installations	3	5/135	1+2+0	1
		6M072302 – Technical Physics of ther-				

		mal processes				
	PPPN 5301	Software Pocket for Scientific Research	3	5/135	1+2+0	1
3.Additional Types of Training		**Master's Reseach Work and Fullfilment of Dissertation**				
	NIRM I	Research Seminar I	1	1.66/ 45		1
		Professional Internship				
	IP	Research internship	1	1.66/ 45		1
Semester 2						
2.Compulsory Profes-sional Mod-ules - 14 credits		**Compulsory Professional Module 3**				
	TPS 5207	Thermal Physics of Conducting Media	3	5/135	1+2+0	2
		Compulsory Professional Module 4				
	OPSF 5208	A Survey of the Main Principles of Con-temporary Physics	3	5/135	1+2+0	2
3. Modules of Individual Educational Paths - 20 credits		**6M072301 – Technical Physics in Heat Energy**				
	OKT 5302	Computer Technologies Optimizaion	3	5/135	1+2+0	2
	PNE 5303	Perspective Direction in the Energy	2	3/90	1+1+0	2
		6M072302 – Technical Physics of ther-mal processes				
	IKNI 5302	Information Technology and Computeri-zation of Scientific Research	3	5/135	1+2+0	2
	FRGZh 5303	Physics Real Gas-Liquid	2	3/90	1+1+0	2
3.Additional Types of Training		**Master's Reseach Work and Fullfilment of Dissertation**				
	NIRM II	Research Seminar II	1	1.66/ 45		2
Semester 3						
3. Modules of Individual Educational Paths - 20 credits		**6M072301 – Technical Physics in Heat Energy**				
	ERT 6304	Energy-saving technologies	2	3/90	1+1+0	3
	TM 6305	Thin-film Microelectronics	3	5/135	1+2+0	3
	FORN 6306	Physical Basis of Radar and Navigation	2	3/90	1+1+0	3
	MTF 6307	Simulation in 3D-modeling in technical physics	3	5/135	1+2+0	3
	ET 6308	Experimental Thermal Physics	2	3/90	1+1+0	3
		6M072302 – Technical Physics of ther-mal processes				
	DNMG 6304	Diffusion Instability In Multi Component Gas Mixtures	2	3/90	1+1+0	3
	FSNP6305	Fractal Properties of Nanostructured Semiconductors	3	5/135	1+2+0	3
	SGN 6306	Laboratory Workshop Special Chapters Nanoelekronics	2	3/90	1+1+0	3
	PTT 6307	Plasma Technology in Thermal Energetic	3	5/135	1+2+0	3
	DEP 6308	Diagnosis of Energy and Technological Processes	2	3/90	1+1+0	3
3.Additional Types of		**Master's Reseach Work and Fullfilment of Dissertation**				

Training	NIRM II	Research Seminar III	1	1.66/ 45		3
		Professional Internship				
	PP	Pedagogical Internship	3	5/135		3
Semester 4						
3.Additional Types of Training		**Master's Reseach Work and Fullfilment of Dissertation**				
	NIRM IV	Research Seminar IV	4	7/180		4
		Professional Internship				
	IP	Research internship	2	3/90		4
4. Final certification	KE	Complex Examination	1	1.66/ 45		4
	ZD	Dissertation Fulfillment and Defence	3	5/135		4
TOTAL			**59 credits**			

C Peer Report for the ASIIN Seal

1. Formal Specifications

Criterion 1 Formal Specifications

Evidence:

- Self-assessment reports
- ICT-based programme management system UNIVER
- Student's guide (not presented to the panel)

Preliminary assessment and analysis of the peers:

The formal specifications provide the necessary information on duration of the programme, expected workload as well as the structure and the possible choice of individual trajectories. The titles of the degree programmes correspond to the disciplines and contents taught and reflect the relevant level of the EQF (Level 6 for Bachelor's programmes and level 7 for Master's programmes). For all the stated programmes, the decreased number of students intakes in the years 2011-2013 are due to a low birth rate after fall of the Soviet Union. The programmes usually start annually, in the fall semester. The tuition fees indicated in the SAR are reflecting the exchange rate as of February 2014; the amounts indicated in this report refer to the exchange rates valid in July 2014.

The panel has not found any detailed information on the website of the university, which would be helpful for graduates of secondary schools willing to study at the al-Farabi Kazakh National University. It is therefore recommended to update the website in order to increase transparence and visibility of the programme's contents.

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

The university confirms to implement this recommendation (E 3.) in very near future for the programmes under review and also suggest to the university management to implement this for all programmes offered. The implementation of the recommendation (E 3.) will be assessed during the re-accreditation.

2. Degree programme: Concept & Implementation

Criterion 2.1 Objectives of the degree programme

Evidence:

- Self-assessment reports
- ICT-based programme management system UNIVER

Preliminary assessment and analysis of the peers:

The contents and the design of programmes presented fit consistently the strategy of the University which has not only been awarded the status of a Research university, but is also aiming at providing an application-oriented higher education. The panel confirmed that the research projects conducted within the faculty are above the average, but also the practical focus of the programmes and the possibility of individual choice as very positive. The peers deemed that the content addressed in the programmes in review correspond to the qualification levels according to the requirements of the European Qualifications Frameworks for Life-Long Learning (EQF – LLL) on the level 6 for Bachelor's and respectively 7 for Master's programmes as well as to the requirements defined in the Dublin descriptors. Therefore, the compatibility with the Qualifications Framework of the European Higher Education Area is given. The peers confirm that the qualification envisaged by the programmes corresponds to the international requirements of the labour market as well as to the expected developments in the science.

Criterion 2.2 Learning Outcomes of the Programme

Evidence:

- Self-assessment report
- Discussions with representatives of the university (programme coordinators, teaching staff)

Preliminary assessment and analysis of the peers:

The intended learning outcomes (in cases where they have been defined on two different levels – Bachelor's and Master's respectively) correspond to the expected level of knowledge, skills and competences and reflect the requirements defined in the respective subject-specific criteria of the Technical committees of ASIIN.

For instance, in the field of Technical Physics, for the Master's level such requirement to the learning outcomes as "understanding of contemporary issues and research opportunities/challenges related to energy and sustainability", what is comparable with the

Learning outcomes defined by the Technical Committee 05 – “Physical Technologies, Materials and Processes”, for Master’s for instance “are qualified to apply innovative methods to problem solutions”. For Physics and Astronomy, the ability to “design components, devices, and systems to meet specific needs in radio engineering and electronics” is required on Bachelor’s level, and the Learning outcomes defined by the same Technical Committee stating that the graduates “have learned the fundamentals of engineering design methodology and have the competence to apply them systematically” is also fitted. The same is true for application skills of Bachelor’s graduates of Nuclear Physics, supposed to be able to apply “the development of methods of recording and ionizing electromagnetic radiation and measuring methods of the quantitative characteristics of nuclear materials”, which is reflecting the standard “They have an extensive understanding of the fundamental principles of physics, their inherent relation and mathematical formulation and, based on this, have acquired methods suitable for theoretical analysis, modelling and simulation of relevant processes” defined by the Technical Committee 13 – “Physics”. Consistent comparison of the Learning outcomes defined by the programmes with the respective subject-specific criteria of the Technical committees clearly shows that the programmes presented for audit reflect the level required for awarding a Bachelor’s or Master’s degree respectively.

However, the self-assessment report of the programme of Nuclear Physics is stating the same learning outcomes on the Bachelor’s as well as Master’s level. From the analysis of the relevant documents, such as Bachelor’s and Master’s theses, course works, experiment’s description, the peers could see that the Master’s program in Nuclear Physics corresponds to the international requirements. For further assessment of this programme, it is absolutely necessary to have the learning outcomes for the Master’s programme stated separately. The panel also recommends to improve the definition of the research objectives: In the case of the Bachelor programme research subjects are listed, which are too specific to characterize the whole programme, the corresponding list for the Master programme lists very general goals of a scientific educational programme, which have no specific relation to a research programme in Nuclear Physics.

The panel found the definition of the respective learning outcomes partly confusing. For instance, in the module handbooks of Material Science and New Material Technology, the learning outcomes are defined on the three levels of knowledge, skills and competences, whereas in the self-assessment reports of the same programme, the specific learning outcomes are divided into knowledge, understanding, synthesis, analysis, evaluation, which makes the comparability of the learning outcomes stated in these documents difficult. Also consistency with the objectives shown in the objectives matrix is not given. The same is true for Physics and Astronomy as well as Technical Physics. It is strongly recommended to choose one form for defining the learning outcomes and to follow it consistently in order to ensure transparency for students, applicants and teaching staff. Also the allocation of the learning outcomes is not always clear, since in some cases, definitions rather corresponding to “skills” have been put as “knowledge” (e.g. Nuclear Physics: “Be able to apply the experimental, theoretical and computational methods of research in professional activities”, “To be able to professional use of modern equipment and instruments”). For internal as well as external assessment of the achievement of the learning outcomes, they must be clearly and consistently defined. It is therefore recommendable to revise the allocation of intended learning outcomes to the categories chosen by the higher education institution.

Criterion 2.3 Learning outcomes of the modules/module objectives

Evidence:

- cf. module description in the module handbook presented as annex to the self-assessment report
- Module handbook in the data base UNIVER, used by the teaching personnel and students (individual log-in needed, in Russian/Kazakh only)

Preliminary assessment and analysis of the peers:

It is commendable that the learning outcomes are written in a quite detailed way and most of the definitions are following the competence-oriented approach (stating the spheres for application, issues for analysis, possibilities of synthesis etc.).

The relevant stakeholders (students and teachers) confirmed that they are aware of the intended learning outcomes of the programmes as such, as well as of the modules and that they are accessible in different source (teachers – syllabus and module handbook, students – student’s guide). However, on the website of the university, no detailed information on the programmes is accessible. The learning outcomes represent a matter of interest for prospective students and also for potential employers. Therefore it is recommended to make the description of the learning outcomes accessible on the website, as already stated above.

Moreover, no detailed module description and therefore also no clear definition of the learning outcomes foreseen are in place for the assessment of the external internships. Such descriptions are needed in order to provide students and employers a clear definition of what is expected from the internships beforehand. Peer panel learned that in every internship contract, learning targets are defined individually. A clear description of the intended learning outcomes from the internships should be however developed on the level of the programme.

In general, the module handbook seems to be incomplete and should therefore be thoroughly revised. For instance, a few courses of curriculum are missing (for example such modules as EP 101 and PT 202 in Bachelor's programme in "Material Science"; NRNP 5303, RBNM 3304, Chem 2432 in Bachelor's programme "Nuclear Physics"). Moreover, some modules are not described fully: in some cases were modules included several parts, not always are all parts described, e.g. module 12 "Chemistry", module 13 "Organic chemistry and biochemistry" in Bachelor's programme "Material Science").

Criterion 2.4 Job market perspectives and practical relevance

Evidence:

- Overview of companies for practical training
- Description of expected learning outcomes

Preliminary assessment and analysis of the peers:

The contents of the programmes presented for the review show a high level of practical relevance. The transfer of the learnt material into the practical application is ensured by including nearly 20 ECTS on different stages of the studies into the obligatory curriculum of students. This concept of "permanent internship" is an asset and was evaluated by the peers as very beneficial for the overall professional development of students. External practical placements are organised by the students themselves, in case where it is needed, assisted by their advisors. The teaching personnel mentioned that students usually work on a concrete question/project during their internship which they are supposed to solve independently and to report on their findings after the completion of the internship. Even the practice of defenses of such reports is in place. However, as mentioned above, it is not clear what content-wise relevance the internship must have, since there is no concrete module description for the internships, which impedes the clear assessment of the factual level.

From the discussion rounds with the students, the panel learned that the HEI is offering a range of research internships in its own research facilities, which is used as a tool of early motivation of the students to proceed with the academic career. This practice was also deemed as positive, since it allows for a direct application of the learnt material into practice in an early stage.

The HEI has presented a detailed qualitative overview of the job placement of its alumni by indicating the work field (academic, industry, not by major) and has proven that it is following up the career path of its students carefully. Several relevant cooperation agreements with the industry for conducting external (professional) internships and for offering additional lectures have also been presented, among which also names of future employers of the students were listed.

The peers deemed it to be a good practice that the employer's are included in the decision making processes for curriculum update (usually once a year), which has been mentioned by the programme coordinators and the teachers. Thanks to this practice, the HEI ensures that there is a clear demand for its graduates, which are successful as far as job placement is concerned.

Criterion 2.5 Admissions and entry requirements

Evidence:

- cf. Academic Policy of the al-Farabi University, pp. 20-21.

Preliminary assessment and analysis of the peers:

The chapter „Admissions“ of the Academic Policy of the al-Farabi Kazakh National University as of 2014 (p. 20) clearly demonstrates the admission requirements for Bachelor applicants and also describes transparently what scoring is needed for being admitted to one of the National Universities, to which the al-Farabi University belongs, too. It stipulates as the basic requirement for Bachelor's programme a High School and/or Professional School Diploma. Additionally, a successfully competed Unified National Test (UNT) is required. Since the obligatory state test is offering the option of one elective subject depending on the envisaged study discipline, which can be i.a. Physics, a good level of knowledge upon admission to the studies necessary for the achievement of the defined learning outcomes can be ensured. The regulation mentions also a separate form of testing, the so called complexe testing for international students; however, the panel has not found any written regulation for the recognition of professional attainments or studies conducted abroad. In the discussion with the programme coordinators and also with students, it was stated that any modules/courses attended abroad were easily recognized in the home university.

However, it is not saying in what way knowledge, skills and competencies acquired in a different educational and professional context (such as professional education/a technical apprenticeship in a college) can be integrated and renown in the course of studies. Rules for the recognition of external study attainments/achievements are partly stipulated in the chapter „International Students“ of the Academic Policy, defining the complex test (Bachelor degree) and university entrance exams as a pre-requisite for admission. What kind of testing is in place for national applicants with different educational backgrounds is not clear, therefore the panel requests additional document on this policy.

The chapter „Admissions“ of the Academic Policy of the al-Farabi Kazakh National University as of 2014 (p. 21) stipulates as the basic admission and entry requirements for Master’s programmes, including a good command of the English language, ensured by an obligatory test at the National Testing Center. The second part of the admission test consists in a field specific Program Based Written Exam conducted autonomously by the University’s admissions commission and supervised by the rector and the department of the Academic affairs. This test consists of two theoretical subject-specific questions, whereas the third part is an essay. Since the admission commission consists of the department professors, checking the compliance of level of knowledge upon the admission with the requirements for successful achieving of the programme learning outcomes is ensured. Additionally, the HEI has the autonomy to define prerequisite courses obligatory for enrollment.

As for prospective students applying for the Master’s programme with a non-typical professional background (e.g. without a Bachelor’s degree), no clear regulation for recognition of this performance was found, neither in self-assessment reports nor in the academic policy. For further assessment of the programme, also here additional information on the current practice in place is needed.

Criterion 2.6 Curriculum/Content

Evidence:

- Curriculum / content overview from the self-assessment reports

Preliminary assessment and analysis of the peers:

The subject-specific parts of the curricula of the programmes in the review were deemed to be all in all content-wise coherent, clear, and in accordance with the newest tendencies of the related disciplines. The objectives matrix presented for each programme beforehand was also considered as commendable. During the discussion talks, it was mentioned that around 30% of all modules are being updated every year. For doing so, regular feedback rounds between teachers, lecturers, HEI leadership and the ministry are organized. Slight changes to the contents can be made internally, i.g. on the level of the faculty (after such an initiative has been started, there is a discussion during a chair meeting). Also employer’s association is being consulted regularly on curriculum update issues, which usually happens in the process even before the university’s council is involved.

Some additional content-wise variation of the programme is also ensured by inviting external teachers/researchers, which is another commendable aspect, since the technical-physical faculty has a good international network. Nearly every months, there is a visiting professor from abroad giving lectures or conducting research at the al-Farabi University. This good functioning international network is not least functioning in such an active way thanks to the fact that every PhD student has got an international supervisor and spends abroad about 20% of the total study/research time.

The Academic Policy presented by the University states that no module should have a repeating title. That is why the panel found it confusing that some courses having the same title, but different codes appeared in Bachelor's, then in Master's and even in PhD curricula (cf. p. 23, the module "Radiation Material Science" is repeated in the Bachelor's programme – seventh semester, then in PhD program – 1st semester, and a "Radiation Materials" module is also included in the Master's). Even though the programme coordinators and the teachers have confirmed by stating some typical contents that the modules do have a very different level, it is recommended to make the difference visible in the module title (e.g. “Introduction to…”/”Fundamentals of…”/”Advanced level”, “Scientific colloquium on…” etc.) in order to ensure transparency.

The peers confirm that there is a clear level difference between contents of the Bachelor's and the Master's programmes, visible from the thesis works, course papers and experiments conducted in the classes.

Internships: the audit team has learned that during the Bachelor's programme, ten weeks of industry practice and five weeks of production practice are foreseen. Additionally, five weeks of research practice are obligatory for all students, before they get one month off for writing the thesis (cf. also workload during the thesis). The panel found it commendable that there were various forms of internships. Especially positively is to stress the practice on involving students into governmental projects. The students are not only actively participating in the research activities, it is also a good practice for increasing the employability, since this kind of projects count as work experience. Although the panel has not been given any written description of the internships and the intended learning outcomes as a module beforehand, from the audit talks with programme coordinators and teachers, some additional information on the internships emerged.

There is always a contract with the learning targets compiled in advance to every internship, and that upon completion of such placement, the students present a report in an academic defense setting. These internship targets should clearly mark the difference between the internships taken in the 2, 3 or 4 year of study and also be aligned with the overall Learning Outcomes of the programme. Thus, the new description should also be included in the objectives matrix.

Physics and Astronomy:

The curricula of both Bachelor's and Master's programmes "Physics and Astronomy" were deemed to address rather traditional contents in a sense that some important newest tendencies of astronomic research were not sufficiently integrated into the module contents, e.g., the recent advance in observational techniques is not fully reflected. More specifically, techniques based on interferometry (radio as well as optical) or adaptive optics are not covered in any depth. Nevertheless, also here, clear coherence with the standards defined by the Technical Committees of ASIIN is obvious. The practical skills for independent conducting of experiments, trained in a significant amount of hours in the laboratory work and basing on the solid (but rather traditional) fundamentals of Astronomy and Physics is for instance corresponding to the requirement that graduates of Masters "are qualified to plan, construct, and conduct experiments and interpret the results (focus on experimental physics) in order to solve complex physical problems or use simulation and modeling on the basis of physical fundamental principles (focus on theoretic physics)."

During the discussion round with the programme coordinators, the panel was told that the current Bachelor's and Master's programmes "Physics and astronomy" originally have been designed and are still aiming at preparing the human resources for future teachers of secondary schools. Nevertheless, the description of the facilities owned and used in teaching as well as in learning by the department of Astronomy telescopes (i.a. observatories located in the nearby mountains, radio telescopes, good relations to the National Institute for Cosmic Research) shows that the learning outcomes can be achieved in this setting. The Master's programme is much more focused on research in such fields as astronomical techniques (optical and radio based), telescopes enhancement, data analysis and information technology, remote control, nano-electronics, search for dark matter. The programme coordinators mentioned that the topics for the student's thesis works, especially for Master's, were usually suggested by the supervisor and connected to his/hers research activities, which in the end compensates a rather conservative curriculum. As major research and teaching foci, the programme coordinators named Variable Stars, Cosmology, Spectrophotometry, and Astrophotometry.

Nuclear physics: Also the research done within the department of nuclear physics reflects the challenges faced in this field on the international level. In close collaboration with the Institute of Nuclear Physics, based on a cooperation agreement, the fields of basic research in experimental nuclear physics, reactor technology and nuclear medicine are addressed. Also in theoretical Nuclear Physics collaborations have been established to Institutions of international reputation. Traditionally strong links exist to the Joint Institute for Nuclear Research in Dubna (Russia), more recently collaborations with other institutes have been established. The qualifications of Bachelor's graduates clearly fit the requirements of the Technical Committee 13 – Physics, i.a. stating that the graduates "have sound knowledge of classical physics (mechanics, electrodynamics, thermo-dynamics, vibrations, waves and optics) and are familiar with the fundamentals of quantum, atomic and molecular, nuclear, elementary particle and solid state physics". Despite the fact that the contents of this study programme are mostly pre-defined by the ministry, individual paths and slight changes for further enhancement on the faculty level are possible.

Material Science and Technology of New Materials: As a positive aspect about the Bachelor's programme, the possibility of choosing three Individual Educational Trajectories modules (IET) was mentioned, being either scientific research activities (IET 1), industrial and technological activities (IET 2) or design activities (IET 3). Also within the master's programme, a choice between IETs Environment (metal and dielectric condensed materials), Material Science Photovoltaic Devices, Space Materials, Total Materials (various material aspects) as well as Technology (mainly semiconductor) are possible. The panel deemed the vocational modules as a positive example of a good combination of natural science modules (e.g. Module 10 and Module 11) and engineering modules (e.g. Module 8 and Module 9). The panel recommends, as already mentioned above, to include external internship in the overall program design by defining specific learning outcomes to be streghtened within this practical phases. The peers recognized a clear differentiation of the two qualification levels under review, and see i.a. the ability "to use the knowledge and understanding to conduct developments (products, processes, methods) in accordance with predefined and specified requirements, realise the results, and work with engineers and non-engineers in teams", as required by the Technical Committee 05, as given and the requirement as fulfilled.

Technical Physics: It has been positively evaluated that there is a possibility of choosing an individual path among such fields as Applied Thermal Physics, Radio physics and Nuclear Physics (in Bachelor's) and Heat and Thermal Processes (in Master's). After the analysis of module contents and an analysis of the labs, the peers confirm that all these foci enable the graduates to "use their ability as engineers to judge in order to structure, process, and/or complete complex, technically demanding, and/or incomplete information in such a way that utilisation under consideration of scientific aspects is safeguarded" and also "to develop and/or optimise systems, processes, and methods on the basis of the learned (degree programme) findings, ideas, products, processes, and methods" as defined by the Technical Committee 05. Since the programme has a rather practice oriented profile, also here internships should became a coherent part of the curriculum design – and get a sound description.

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

The university has submitted the new formulation of the learning outcomes for the programme in Nuclear Physics at the Bachelor's and Master's, which is valid, assessable, and adequate for the respective level. The inconsistent formulation of learning outcomes in different programme documents will also be communicated to the University's management and assessed upon the re-accreditation. Moreover, the University plans to make the learning outcomes accessible on the website, not only for purposes of transparency, but also for better intake rates. The panel strongly encourages following this plan, since the visibility of the learning outcomes to all relevant stakeholders is a prerequisite defined in the ASIIN criteria for accreditation of degree programmes and therefore a requirement (A 3.)

The University plans to revise the module handbook as far as module objectives, especially for the final thesis bibliography of modules and workload are concerned. All coinciding modules names and codes have already been changed, which is very laudable. As for including of internship description as separate modules (every internship as a separate module), the university states that internships with individually defined learning outcomes are considered as an additional form of training from the point of view of the university's management and that they are therefore not included in the curricula until now. According to the ASIIN criteria, any kind of obligatory training has to be included into curricula and module handbook and aligned to programme objectives and learning outcomes. It is necessary to revise the module handbooks as stated above in the report and include any educational activity into the module description and curriculum respectively for better transparency and increased coherence (A 1); otherwise the criterion 2.3 is not fulfilled.

As for the admission regulation, the university stated that work of the admission office is fully controlled by the Ministry of Education and Science. For Bachelor's programmes, the Unified National Test is also needed for applicants with an apprenticeship background. In order to be enrolled by the Al-Farabi Kazakh National University on the self-payment base the score in the Unified test should be higher than 69. In order to benefit from a state grant from the Ministry of Education and Science, the score should be even higher and varies from specialty to specialty. For example, it was 82 or higher for Nuclear Physics this year. The university has also clarified the admission situation for students with non-typical background willing to be enrolled into Master's Programme, stating that the graduates of other Bachelor's programmes can be accepted in cases where the core curriculum does not differ from the one offered at Al-Farabi Kazakh State University in more than 8 modules, out of not less than 5 are compulsory. This rule ensures comparable starting conditions for the students and assures a good level of knowledge already upon admission. The criterion 2.5 is therefore fulfilled.

The panel moreover recommends to include the most recent findings in the field of Astronomy into (by now rather traditional) curriculum (E 1).

3. Degree Programme: Structures, Methods & Implementation

Criterion 3.1 Structure and modularity

Evidence:

- Curricula presented in the self-assessment reports
- Academic Policy, p. 71

Preliminary assessment and analysis of the peers:

The modules have the following size: from one to three units (courses, workshops), taught in three different forms (lectures, seminars, laboratory work) and having a workload between 5 and 10 ECTS. The modules do build coherent packages of learning units, combining for instance theoretical courses with practical workshops (cf. Details of Machine Elements combined with Autocad Design Editor, Optics combined with a Physics workshop on optics). The Academic policy states that every module has to be completed within one semester time, which is the case in every programme and which facilitates student mobility. The university has 234 agreements for cooperation with foreign universities, among which there are already established and well running joint programmes on all levels (cf. p. 71 of the Policy). The student mobility (but also staff mobility within another funding chapter) is ensured by the state funding programme Bolashak awarding grants for studying abroad for different periods of time for especially gifted students. Students have confirmed that modules completed abroad are easily recognized by the home university. An excellent internationalization strategy is being pursued in case of the PhD programmes, where every student has got a foreign supervisor whom he/she visits at least once a year for two months.

Still, on every level it was mentioned that the internationalization initiatives can still be further developed, and that this is the part of the university's general strategy to strengthen the internationalization initiatives by additional funding and further expanding the networks.

As for the final thesis, both on Bachelor's as well as Master's level, the writing and the defense of the thesis is taken as a separate module. As mentioned in 2.6, the panel recommends to revise this practice and to think of including the external research internship, de facto serving for gaining/gathering material for the thesis, into the final thesis module, which would have the positive effect that through additional ECTS numbers, the weighting of the final thesis in the final grade would increase.

The University has got a special permission to adapt their curricula according to the best practices and to the needs of the labour market, keeping a certain number of obligatory elements such as History, Russian, Kazakh and English. The University should use this autonomy in order to improve and further develop its programmes and modules, not least according to the recommendations provided by ASIIN peers.

Criterion 3.2 Workload and credit points

Evidence:

- cf. self-assessment reports
- Academic policy

Preliminary assessment and analysis of the peers:
In Kazakhstan, a national credit system is in place slightly differing from the European credit system. 1 Kazakh credit point equates to 50 minutes of contact hours or 60 minutes of self-study. According to the institution, 1 ECTS credit equates to 25 – 30 hours of student workload, depending on the programme. Each semester, between 25 and 30 ECTS are awarded. The factual workload of the students remained unclear, since the calculation of the ECTS stated in the curricula does not seem to reflect the factual level of workload. In the self assessment reports it was mentioned that neither homework nor guided self-study or student self-study are included in the calculation of the ECTS workload, whereas in the original concept of the ECTS, all kind of work connected to the studies and foreseen as necessary for achieving the intended learning outcomes are to be calculated in the workload. The panel was told that the current approach to estimating the ECTS number for modules is based on multiplying Kazakh credits with a concrete factor (1,5 within the Bachelor, Master and PhD studies for Material Science and Technology of new materials as well as Technical Physics, whereas for all other programmes, the factor 1,66 is used, why the factor is different in these programmes has not become clear).

The European standards recommend that the total workload must not exceed 30 ECTS per term, i.e. a maximum of 900 hours must include every kind of work student is supposed to do for his studies. This regulation is based on the argument that the students need time for independent scientific work in case they want to deepen their competence in one or another of the fields of their discipline. Kazakh credit point system is based on the contact hours, which explains why, for instance, completion of a Master's thesis is awarded with 5 ECTS, whereas teachers, as well as students have confirmed that the students have the whole last semester for completion of the thesis. The discussion with the teachers showed that also the last external internship students are supposed to take is considered to be a preparatory research internship for the Master thesis, so that the time dedicated to research and the factual workload is partly distributed among these entities. However, the low rate of the ECTS for the Master thesis leads to the fact that the influence of the grade for the thesis in the final grade is very low (5 out of 99 in case of Nuclear Physics). This approach to the ECTS does not to correspond to the usual grading/weighting system in Europe, which could be an obstacle in recognition processes abroad, i.g. in other Bologna signatory countries. The panel strongly recommends to set up a new, coherent ECTS calculation. In case of the Master thesis, it could be a new module design with a new allocation of ECTS, reflecting the whole range of the work to be done for completing the thesis. We have learned that the number of ECTS allocated to the modules is in most cases prescribed by the ministry, and it might not be easy to change it. Though the panel deemed that for the long-term success of the programme, it is necessary to undertake this kind of change, and strongly recommends revising the given ECTS distribution.

The same is true for the credits awarded for the internships – it is not clear, why for pedagogical practice, 5 ECTS are calculated for a total of 225 hours (cf. the curriculum for Physics and Astronomy, Bachelor's), which would mean that 1 ECTS credit point equals 45 hours, which would correspond to the Kazakh credit, but not ECTS (cf. p. 9 of the Academic Policy).

The quality of teaching and the level of learning do not seem to be negatively affected at this stage, although the factual workload seems to be rather high. However, the issue of independent scientific work conducted by students is of a great importance for the development of the individual research profile, especially for master's students, and in case the workload presented in the curriculum only reflects the contact hours, a serious student's overload could become a threat.

Criterion 3.3 Educational methods

Evidence:

- Discussion rounds with programme coordinators and teaching staff

  (There has been no written information delivered on the educational methods)

Preliminary assessment and analysis of the peers:

The principle of uniting teaching and research is according to the programme coordinators and the representatives of the rectorate one of the priority areas as far as teaching methods are concerned. Students confirmed that many of them have been involved in the research projects of the teaching staff in the framework of their research internships, which aligns teaching and learning to the research activities, at least in these individual cases. Generally, round 30% of all modules are revised and updated annually in order to ensure their up-to-dateness as far as newest findings are concerned (e.g. including contents on nonlinear theory in astronomy).

The teachers have stated the following forms of interactive teaching as preferred ones, showing an awareness of the importance for integrating them adequately to different contexts: case studies, discussions, essays, presentations, work groups. The teachers have shared their thoughts on supporting methods for very advanced students, who are ahead of the rest of the group, and named i.a. delivering additional tasks, inviting them to “scientific clubs” (colloquia for specialized exchange, available at almost every department), helping to organize student’s conferences with publication options and early involvement into the research projects as possible solutions. For students who have difficulties to keep the tempo or to catch up, there are special classes integrated into the schedule in order to support them additionally. In case they fail during the examination period, they can attend additional classes during the summer term (cf. B-4).

Also the obligatory modules of guided self study (homework to be delivered before the intermediate test) and self study with teacher (mostly independently conducted work on additional tasks with input questions and guidance upon request from teacher’s side) are all in all a good practice to support independent learning. However, it must be reconsidered in order to avoid student’s overload once a clear picture on the factual workload has been delivered.

Also a good practice is the advanced use of the ICT programme UNIVER, in which not only normative documents such as course description, intended learning outcomes and bibliography are provided, but also teaching materials, teacher’s notes and other course relevant updates are available.

For updating the methodology used, the university invites regularly international experts for conducting specialized trainings which every interested party might join. There are also didactical-methodological seminars at every chair in order to enable exchange.

All in all, the peers deemed that the teaching methods in place support the achievement of the intended learning outcomes.

Criterion 3.4 Support and advice

Evidence:

- Academic policy
- Discussions with the programme coordinators, teaching staff and students

Preliminary assessment and analysis of the peers:

According to the information sources stated above, following support and advice offers are in place: Tutorial-scientific advisor, Advisor available in the student dormitories, Counseling on international mobility, Medical center, Support to families. Although no written information on the support and advice facilities was provided, the panel has gained insights into counseling process from discussion talks with all involved stakeholders. The peers found the enthusiastic support attitude shown by the teachers as well as obvious trust from the student's side very positive. The students have named the head of department or the dean as the right contact person in case they have any trouble with their studies, which shows that the university is practicing and open-door-mentality. The panel can confirm that the offer on support and advice is above the average of what is in place in Europe (for instance, offering tutoring hours/supervision in the student dormitories is a rather unusual).

Among the broad offer of support and advice, the support of families is to be mentioned separately: besides the financial support, there are also special dormitories for students with families. There is also a peer-to-peer support service among students themselves: within the measures of educational work, PhD student help younger students with their studies. The peers deemed this mutual benefit (the ones, aiming at working in the academic field later or, can practice for their future teaching activities, the others get specialized support by students "peers").

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

The university explains that the number of credit points awarded for the final thesis is referring to the very last stage of compilation; it further states that it is common practice to include at least two internships in thesis workload including external one, so that the actual workload for the thesis is higher. The panel understands that the factual time spent on compilation of the thesis is higher than the indicated ECTS. Since the internships serve for compilation of the final thesis, they should be combined in one module "Final thesis" in order to assure comparability not only as far as ECTS are concerned but also in order to reflect the workload content-wise.

As for the workload in general, the university states the Kazakh credit system is based on teacher's workload and not on student's workload. The panel understands the argumentation and points out that the conversion of the Kazakh CP to ECTS must be done consistently and be transparent in such relevant public documents as Diploma Supplement (A 4) and Module handbooks (A 1) in order to assure that the inconsistent conversion impedes academic mobility and international comparability.

4. Examination: System, Concept & Implementation

Criterion 4 Exams: System, concept & implementation

Evidence:

- Self- assessment reports
- Academic Policy

Preliminary assessment and analysis of the peers:

According to the self-assessment report and the information gathered during the discussions, the **exam methods** described subsequently are foreseen: written exams, project defense, reports on internships, option for external thesis, students' independent work (results to be presented at the intermediate control), multiple-choice-tests, abstracts, final thesis, including a defense of the results.

The respective form of examination is stated in the module handbook, which is accessible to all relevant stakeholders via the ICT system UNIVER. As a good practice, the panel distinguished the cooperation with external parties (industry as well as external research institutes) for conducting applied research within the Bachelor's and Master's thesis, which enables students in an early stage allows to identify an application area for their abilities and to use scientific tools for solving practical problems. As another good practice, the panel evaluated the fact that every exam is being assessed anonymously by peer teachers and not by the professor of each class itself.

The intermediate control, consisting of weekly papers/work examples, but also activity in the class are counting as 40% of the total grade for the module assessment (the 60% being counted from the assessment results from the last, mostly written exam), is one of the peculiarities of the exam system. The final written exam consists of 2 theoretical and one practical question; in case the student chooses an oral exam, there are 40 minutes for preparation of 3 theoretical questions or case studies, after which individual assessment based on these questions is conducted. The discussion with teachers and students has shown that there is a positive shared vision by both parties and that no overload due to the exam number is in place, although the students confirmed that the intermediate control weeks cause an especially high workload. That is why the panel recommends to monitor this issue in order to avoid student overload in cases when students have several such controls at the same time. Moreover, the panel recommends to revise the practice of completely free decision of students whether they want to be assessed in the written or in the oral form (cf. self-assessment report of new material sciences, p. 9). The panel has been told that it is possible to graduate without having taken any written or oral exam and vice-versa. However, we must stress that the examination methods should enable checking the achievement of the learning outcomes, among which the HEI has formulated the ability “Communicate effectively in written and oral form, both, individually and as a member of a multidisciplinary team” (cf. self-assessment report in Technical Physics) or “communicate effectively, both orally and in writing, in the field of radio engineering and electronics” (cf. self-assessment report of Physics and Astronomy). It is surely very positive for students, and a good practice to support student’s extracurricular initiatives such as taking part in the scientific clubs in order to strengthen their debate abilities; given that it is not an obligatory part of the curriculum, it can only be considered as an additional training possibility. It is recommended that the HEI revises its approach to examination by introducing at least one obligatory oral examination (before the final state exam, since students should be given the possibility to practice beforehand), shifting towards a competence-oriented assessment by coherently checking the achievement of the defined learning outcomes.

The exam periods, and also the number of exams (usually between 5 or 7) are announced to students in advance, so that all in all, they stated to have enough time for preparation. The option of make-up exams (so called summer semesters), is in place. These follow a short and intensive period of time in which repeating of the module contents with a teacher is facilitated. This option is not free of charge, i.g. the student is supposed to pay a fee calculated on the base of the credit points awarded for the summer semester. In case the student fails again, he or she loses the right for the scholarship (so the studies are to be continued on a paid basis. The panel deemed for positive that in case of falling sick, students were able to take leave and retake the exams at a later point in time, before the completion of 4th year of study. As another strong point, the additional advisory service provided to students was mentioned, since in the discussion rounds, it was mentioned several times, that the exam regulations are additionally being explained by the academic supervisor on a regular base.

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

The university plans to implement a competence-oriented approach to the examination policies and include obligatory oral examination into the teaching process before making students undertake the state exam at the end of the study. The panel emphasises that it is absolutely necessary (A 2.) to adapt the examination practice to the module objectives, since the practice of free choice of the examination form by students does not assure the proper assessment of the achievement of the module objectives.

5. Resources

Criterion 5.1 Staff involved

Evidence:

- cf. staff handbook
- list of and information about research projects in the self-assessment report
- academic Policy

Preliminary assessment and analysis of the peers:

The university management has shown a consistent strategy of attracting and developing qualified staff for the transformation of al-Farabi University to a research university, which was formulated as the crucial strategic aim for the next years. As key research foci, experimental and theoretical physics, mathematical mechanics, biotechnology, physical analysis, new chemical technology, environmental issues as well as nano-technology were named. For implementation of these core foci, 8 scientific institutes were established, as well as a national technology park (“innovation park”) and an incubator of start-ups, also for students which has already enabled some very successful commercial projects. The university’s staff conducts fundamental research in further scientific fields, such as arts and sciences, energy, resources and recycling as well as life sciences. The university pays great attention to regular publications in international impact-factor journals, which is already demonstrated by the fact that PhD students are supposed to prove significant publication activity (cf. p. 43 of the Academic Policy at least one article at international journals with impact factor higher than zero, at least three articles at national journals recommended by the Ministry of Education and Science at least three conference materials).

For broadening the range of the courses offered, a good exchange relation with former CIS countries has been established. Nearly every month, there are visitors working on all levels, not only for giving lectures, but also for research purposes. Moreover, the university has established very good relations to other Kazakh universities for facilitating joint staff exchange and staff development (especially Karaganda State Technical University and Euroasian University).

The Academic Policy states that the department must have at least 10 full-time teaching staffs, and 40% of them must have academic degrees (PhD). The staff handbook shows not only a quantitative fulfilment of this criterion, but also a broad variety of research projects conducted in the faculty in the last 5 years, which ensures a good scientific base for adequate implementation of the programmes as far as achieving the learning outcomes is concerned.

The workload of the staff as presented in the academic policy for different groups and qualification levels of teachers specifies the quantity of teaching obligations in relation to the overall workload. However, the panel was not able to gain a clear picture about the additional workload produced by other activities mentioned by the teaching staff during the audit, as for instance administrative obligation, supervisor obligations, workload produced by conducting classes of guided self study. The teaching staff has mentioned that the overall workload situation has improved since the former times when teaching and research were rather separated, and that now, there is more time for research activities. In order to ensure quality of teaching, quality of research work must be ensured. Therefore, the panel additionally requests a concrete overview of the factual workload, including all obligations of teachers, ideally with examples of every relevant teaching category.

Criterion 5.2 Staff development

Evidence:

- Acceptance of non-teaching periods for research purposes
- Capacity development offers / Further education

Preliminary assessment and analysis of the peers:

The programme coordinators and also the first vice-rector stated that in the point of view of the University's policy, in order to become the best teacher, one must be a good researcher, that is why the key strategy of staff development is enabling as many opportunities for research as possible. The university has shown a range of ways of supporting its researchers and teachers in their further development. On the one hand, there are several options for conducting internships abroad for younger researchers financed either by the faculty, or by the Bolashak programme, the state-driven funding programme for academic development. 26 researchers from the department have already benefited from this funding source, not least as a measure supporting the development of their English skills by working abroad. On the other hand, there are options of research sabbaticals for one year by keeping the full salary paid, in cases where the research plan compiled beforehand has been accepted. The programme coordinators have indicated that in cases where additional time for research is needed, the ratio of research and teaching can be discussed individually, so that the number of teaching hours can be decreased for conducting a research project.

The regular policy of further training for staff requires for every staff member at least one further training within a period of five years. Those could be trainings on methodology, good study programme management etc. For facilitating a more frequent methodological exchange, besides didactical-methodological seminars which are held at every chair monthly, the university invites regularly international experts for conducting specialized trainings which every interested party might join.

Within the university and also on the level of the Technical-Physical Faculty , several scientific traditions, so called “schools” emerged in the past decades. The projects conducted in the tradition of these research foci reflect both tendencies for fundamental research (e.g. “Elaboration of Kazakh-Russian and Russian-Kazakh terminology dictionary "Physics and Astronomy”, “Investigation of physic processes in regions of star formations and in near-nuclear zones of active nuclear galaxies”), as well as newest tendencies in innovative fields of science (“Working out of energetic module that uses the heat from quantum – space radiation”, “Development of Effective Methods of Analysis of Environmental Objects Contaminated with Rocket Fuel Components and Creation of a Scheme of High-Sensitive Biosensor Module for the Presence of Mutagens”). For conducting these projects, the university provides additional research grants and supports its staff in case of application for state grants. Some of these projects are conducted in cooperation with foreign institutions (e.g. Non-linear phenomena in composite nanostructured metamaterials, University of Arizona). These projects are especially beneficial for Master’s students, who are often involved into the project activities on the basis of (paid) assistant placement or also for writing their thesis.

The panel considered as commendable the additional motivation measure for staff by increasing their payment based on Key Performance Indicators. All in all, the staff development measures presented during the audit were deemed for substantial and supportive for achievement of the learning outcomes.

Criterion 5.3 Institutional environment, financial and physical resources

Evidence:

- Description of facilities and laboratories as presented in the self-assessment reports

- Discussion rounds with all relevant stakeholders

Preliminary assessment and analysis of the peers:
In Kazakhstan, the financial situation of programmes and whole faculties depends quite a lot on the state grant provided for student placement. In case of the Physico-Technical Faculty, the financial situation for the next five years is definitely very good, since the demand for graduates on the market is stable with a positive tendency and therefore a considerable demand among the high-school graduates for these programmes is obvious from the statistics on new enrolments. Additional funding from joint research projects with German and Russian HEI brings additional good funding options.

As for teaching and research facilities, the Physic-Technical Faculty has a peculiar position within the university. It incorporates the Scientific Research Institute of Experimental and Theoretical Physics NIIETF, one of the first scientific research institutes integrated to the university structure in Kazakhstan. For instance, in the laboratories of theoretical and experimental physics, such facilities as nuclear physics, accelerators and reactors and dosimeters are always available, such facilities as a synchrophasotron are available for experimental nuclear physics and for astronomy, special telescopes and observatories based in the Tian Shan mountains are in regular use for teaching and research within the Bachelor's and Master's programmes. The Department of Solid State Physics has got laboratories on radiation material science and computer modeling, on semiconductor optoelectronics and nanophotonics, on technical semiconductor structures and on semiconductors and functional materials. The research infrastructure has been deemed for good and partly for very good and supports the achievement of the research-related learning outcomes of the programmes under review (e.g. Nuclear and theoretical physics - "Be able to apply the experimental, theoretical and computational methods of research in professional activities", or Physics and Astronomy – "choose appropriate research methods, modify existing, and develop new methods, based on the specific purpose of research", Technical Physics - "Methods of theoretical and experimental research in the field of technics and technical physics", Material Science – "The formation of scientific research, technical or scientific and methodological programs enterprises, scientific research organization, department, laboratory or participate in shaping the research agenda of higher rank"). Additional research facilities are available in the jointly partner institutes abroad, such as Joint institute for nuclear research (JINR) in Dubna, Russia, where a considerable part of students has taken an internship. The peers appreciated the good level of research equipment, but they also won the impression that the teaching laboratory facilities cover the major needs and necessities. Therefore the peers recommend to strengthen the teaching facilities which ensure the development of basic knowledge and skills, before the students can benefit from the research related facilities.

The peers have learned from students that they can access not only teaching laboratories, but also research facilities in case they have a promising scientific project. After discussion of this project with the director of the institute, a timing arrangement for the laboratory use must be met. Another positive aspect about the infrastructure is the facilitation of access to different super computers for students, e.g. in the Institute of Astronomy and Physics, but also in some partner institutions located in Germany and China.

There are some examples of successful implementation of new research clusters based on private and state funding, as for instance the bio-medical cluster, in which also foreign investors take part. A new cooperation has been established with the University of Rostock which is now offering its chemical laboratory for researchers and PhD student research projects. Since the PhD student mobility is strongly supported by the University (at least 2 months of every year, the student spend abroad), this offer is frequently requested.

There are also some courses taught in English as part of the internationalization strategy of the University, as for instance the master courses (MATLAB C++). The library provides a considerable number of foreign periodicals from such countries as USA, Japan, Great Britain, Russia, out of which the majority is edited in the English language (cf. p. 46 of the self-assessment report of Astronomy), not least to mention the license for using the Springer sources. Other sources are accessible via the cooperation with foreign partner institutions. These already good initiatives are crucial for the successful achievement of the intended learning outcomes, since in each programme, the competence to work in international teams and to follow the most recent scientific developments on the international level has been defined as a must. At latest in the PhD studies, the students are supposed to publish their research results also in foreign languages, so that the fundamentals of the English skills must be solidly strengthened already in the Bachelor's and Master's studies. That is why the panel strongly encourages further increasing the number of specialized courses taught in English and broadening the thematic spectrum of the English journals.

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

The university has stated that an average teaching workload per year is now estimated as 24 credits of teaching a week. The university confirms that other activities such as guided self-study, supervisory activities, but also voluntary surveillance work in student dormitories are not counted in the workload since it is a requirement of the Ministry of Education and Science. Since the university stated that the head of chairs can decide on the workload of their employees, the panel strongly encourages to enable as much workload flexibility as possible in order to enhance research activities and herewith also to positively influence the teaching activities. The implementation of this recommendation (E 4) will be assessed upon re-accreditation.

The university has already got a sound plan of equipment purchase in order to assure sufficient teaching and research material base. The panel encourages the policy of early involvement of all students into research activities and therefore also further development of the facilities. The university has moreover presented a convincing concept of enhancing the command of English in the department, especially as far as student learning is concerned. The respective measures are increasing the number of specialized courses taught in English, especially in elective modules, broadening the subscription to English language journals, providing English language training courses both for students and the staff members, inviting English speaking lecturers from abroad for a prolonged period of time. These measures are very commendable, and certainly partly also helpful for teachers. For successful research activities on global level, the panel recommends to further enhance teacher's and student's command of English (E 2) by further developing the offer of additional trainings.

6. Quality Management: Further Development of Degree Programmes

Criterion 6.1 Quality assurance & further development

Evidence:

- Academic Policy
- University's website

Preliminary assessment and analysis of the peers:

The university has implemented a Quality Management System (QMS), which has been certified with ISO 9001:2008 in 2003 already. Since then, the quality assurance measures of the university a being monitored by ISO annually. The quality assurance processes are described in the student's guide which every first-year student gets in the beginning of the academic year. The university makes an effort to make every student familiar with the management policies in order to motivate them to take part in the annual anonymous surveying. There are also rankings of professors made by students (this mark partly influences the evaluation of the key performance indicators).

The university has shown as another good practice the strong connection to external stakeholder's, whose involvement into the continuous improvement of the programme is one of the crucial instruments for further quality enhancement. The fact that the industry representatives (employer's association) are asked about further development of curriculum and single courses even before the academic council shows a very strong orientation of the HEI to the practical application of teaching activities.

Criterion 6.2 Instruments, methods and data

Evidence:

- Academic Policy
- University's website

Preliminary assessment and analysis of the peers:

Besides the surveying procedures, direct feedback is possible by addressing the cohort supervisor, since in the university's understanding QMS is all about feedback and dialogue. Also professor's surveying is being conducted annually. The methodological bureau of the university collects and analyses the feedback for implementation of possible enhancement suggestions. For closing the feedback loop, the institution has stated e.g. the following practice: in cases where a professor's evaluation is rather negative, the methodological commission conducts a monitoring visit in his class. Students have confirmed that they do see a supportive culture for taking into consideration their feedback, and they especially appreciate the open-door-policy of the supervisors and even Head of Department in case of study-related problems.

Another measure within the given QMS system is assessing the quality of knowledge of student's in the 4^{th} grade, which allows for a prognosis of an achievement of the learning outcomes until the end of the studies.

As one of the QM tools, the university named also the programme managemt IT-based system UNIVER, were monitoring of cohort's performance was possible on the spot. Having this overview, the university has the possibility to react in case of significant changes in the average performance of the students. The panel considered this tool useful and it can be considered a good practice to have a nearly paperless programme management, providing students all the relevant regulation in one place. However, the panel has deemed the personal data protection not to be sufficient – at least according to European standards. In western universities, it would not be possible that students can see the performance results of their fellow students. It is only possible with a special written permission and only for specific reasons, as for instance the quality management. The panel understands that in other countries, the protection of personal data might not play such a significant role as in Germany or Europe in general. However, the panel recommends to revise this policy, or at least to ensure that the relevant stakeholders agree with this procedure.

It is commendable that the institution is following up the professional path of its alumni. The data that have been presented demonstrates a very individual approach to the follow-up of the alumni career. The panel has however missed analysis of the data presented, comments on the procedures for e.g. increasing the number of alumni employed according to their major or finding out why some alumni are working in a not subject-related field. Similarly, no analysis of drop-out rates (about 20%, which is all in all a good rate for sciences and technical study programmes) has been presented. Although during the discussion rounds, the programme coordinators and teachers have shown that they do take preventive measures in order to support students in difficult situations (disease, personal problems) where a threat of a drop out is in place, the panel considers it an important part of a self-assessment process. For the re-accreditation, it is therefore recommended to complete the missing data (explicit statistics on dropouts, explicit statistics on time needed for finding a job placement after graduation) and also to provide analysis of data and a short description of measures undertaken as a reaction to the respective findings.

It is very commendable that the institution not only collects quantitative data, but also delivers qualitative follow-ups of student's mobility abroad. The panel has been provided data with names, titles of projects and also duration periods of the internships spent abroad. However, no data on the percentage of such placements have been presented. The panel has gained the impression from the discussion talks with teachers and students that such kind of placements are available for many students and are not an elite phenomenon. However, the HEI should monitor the demand for such placements and show what proactive (concluding further partner agreements) and preventive (e.g. in case if the student's demand is decreasing) measures are being taken.

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

The university did not provide any statistics on the drop-out rates, but states that it is less than 10%; the dean's office monitors these numbers and reacts in cases where the average increases for some groups. Herewith the university has proven that it takes the numbers into consideration and that the analysis leads to concrete steps in case of need.

The university plans to involve the Center for Career and Business into collecting of the relevant statistical data in order to facilitate proactive and preventive measures in reaction to the local market demands. This criterion is herewith fulfilled.

7. Documentation & Transparency

Criterion 7.1 Relevant Regulations

Evidence:

- Academic policy of al-Farabi State National University for 2014, containing
    - admission regulation
    - examination regulation
    - fee regulation
    - policies of staff recruiting and staff development

Preliminary assessment and analysis of the peers:

The panel found it commendable that the university has not only published the quality management processes on the website with a detailed explanation of the relevant steps, but that it has also compiled a code of conduct for teaching staff and also for students, which assures transparency what respective parties can expect from each other.

The regulations provided in the academic policy are written in a clear and good understandable way. The policy is available to the students and the teaching staff, but the panel has found no proof for the accessibility of the document to the graduates of the secondary educationto start their studies at the al-Farabi university. Since the information the policy contains are relevant also for this stakeholder target group, we recommend either to make the policy public or, in case some parts of it should not be accessible to everybody, publish those abstracts on the website which are relevant for the prospective students.

Criterion 7.2 Diploma Supplement and Certificate

Evidence:

- not delivered

Preliminary assessment and analysis of the peers:

Samples of the Diploma Supplement in English language have not been annexed to the self-assessment report, they are also not part of the academic policy and not provided at the university website. Therefore the panel requests to provide a sample diploma supplement according to the Bologna requirements, containing information about the study aims, generic learning objectives, level, content and status of the studies. Also an analysis of the success of the graduate must be assured based on the statistics provided in the diploma supplement, as well as about the composition of the final grade. In addition to the national grade, an ECTS grading table according to the ECTS Users' Guide should be included foreseen.

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

The University states that only graduates of programmes which has been awarded international accreditation are given a Diploma Supplement. The university did not provide an example of a diploma supplement suitable for the assessment. The issue of a programme-specific Diploma Supplement stating the programme learning objectives and outcomes, structure and level of the degree, as well as about individuals performance and statistical data as indicated in the ECTS User's guide are absolutely necessary for the successful accreditation (A 4).

D Additional Documents

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

D 1. Definition of the learning outcomes for the Master's programme Nuclear Physics
D 2. Module description of internal and external internships
D 3. Overview of the factual workload of the teaching staff of the department (at least one for every category)
D 4. Examples for reduced workload for teaching staff wishing to conduct additional research projects
D 5. Diploma supplement

E Comment of the Higher Education Institution (25.08.2014)

The institution provided a detailed statement.

F Summary: Peer recommendations (27.08.2014)

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

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Material Science and New Material Technology	With requirements	N/A	30.09.2020
Ma Material science and New Material Technology	With requirements	N/A	30.09.2020
Ba Nuclear Physics	With requirements	N/A	30.09.2020
Ma Nuclear Physics	With requirements	N/A	30.09.2020
Ba Physics and Astronomy	With requirements	N/A	30.09.2020
Ma Physics and Astronomy	With requirements	N/A	30.09.2020
Ba Technical Physics	With requirements	N/A	30.09.2020
Ma Technical Physics	With requirements	N/A	30.09.2020

Requirements

For all degree programmes

A 1. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report (factual workload, module description of the final thesis, including increased number of ECTS for the thesis for adequate weighting, module description of internships, consistent module titles, coding of modules).

A 2. (ASIIN 4) The examination modalities must be adapted to intended module objectives. The practice of flexible exam choice is not assessing the achievement of the learning outcomes.

A 3. (ASIIN 2.2) The learning outcomes must be published on the internet and available to all stakeholders (especially to students and staff).

A 4. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual’s performance.

Recommendations

For Bachelor and Master degree programme Physics and Astronomy

E 1. (ASIIN 2.6) It is recommended to include the most recent findings in the field of Astronomy into (by now rather traditional) curriculum.

For all degree programmes

E 2. (ASIIN 5.3) It is recommended to further develop the offer of courses taught in the English language and to further enrich literature resources in foreign languages, especially in English, in order to enhance students’ command of English and foreign languages in general.

E 3. (ASIIN 1) It is recommended to make all formal specifications of the programmes visible on the university’s website.

E 4. (ASIIN 5.1) It is strongly recommended to include in the calculation of teacher’s workload any kind of activity conducted on behalf of teaching, educational process or administrative work in order to obtain a realistic overview of the workload.

G Comment of the Technical Committees

Technical Committee 05- Physical Technologies, Materials and Processes (10.09.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discussed the accreditation procedure. The analysis in the report demonstrated that the Kazakh credit point system did not correspond to the usual grading/weighting system in Europe. The critic of the peers is contained indirectly in requirement 1, but the Technical Committee deemed it for necessary that this issue - revising the ECTS distribution - is noted in a separate requirement (A. 5). Although the number of ECTS allocated to the modules is in most cases predestined by the ministry, the calculation of ECTS stated in the curricula has to reflect the factual level of work load for the students and should be transparent.

The Technical Committee 05 - Physical Technologies, Materials and Processes recommends the award of the seals as follows:

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ba Material Science and New Material Technology	With requirements	N/A	30.09.2020
Ma Material science and New Material Technology	With requirements	N/A	30.09.2020
Ba Nuclear Physics	With requirements	N/A	30.09.2020
Ma Nuclear Physics	With requirements	N/A	30.09.2020
Ba Technical Physics	With requirements	N/A	30.09.2020
Ma Technical Physics	With requirements	N/A	30.09.2020

A 5. (ASIIN 3.2) The students' workload per semester must be set at a level that avoids structural pressure on training quality. In line with the ECTS Users' Guide, the workload per semester must not exceed that of a full-time employee (maximum of 900h). The ECTS credits awarded must be adapted accordingly.

Technical Committee 09- Chemistry (15.09.2014)

The Technical Committee discussed the accreditation procedure. The Technical Committee observed severe inconsistencies in the calculation and distribution of ECTS credit points. The Technical Committee therefore stresses the importance of the respective requirement A1.

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee followed the vote of the peers.

The Technical Committee 09 - Chemistry recommends the award of the seals as follows:

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Material Science and New Material Technology	With requirements	N/A	30.09.2020
Ma Material science and New Material Technology	With requirements	N/A	30.09.2020
Ba Nuclear Physics	With requirements	N/A	30.09.2020
Ma Nuclear Physics	With requirements	N/A	30.09.2020
Ba Physics and Astronomy	With requirements	N/A	30.09.2020
Ma Physics and Astronomy	With requirements	N/A	30.09.2020
Ba Technical Physics	With requirements	N/A	30.09.2020
Ma Technical Physics	With requirements	N/A	30.09.2020

Technical Committee 09- Physics (16.09.2014)

Assessment and analysis for the award of the ASIIN seal:

The Technical Committee discussed the accreditation procedure. For the Technical Committee the different information about the CP in the synopsis was not comprehensible (cf. p. 35 und 36 of the report: the module *State Compulsory Module* is declared between 8 and 10 CP). If the imprecision is also present in the official documents, further requirement should be enunciated in order to avoid misunderstandings. Clear regulations are needed to know how many credit points students have to attain.

The Technical Committee 13 -Physics recommends the award of the seals as follows:

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Material Science and New Material Technology	With requirements	N/A	30.09.2020
Ma Material science and New Material Technology	With requirements	N/A	30.09.2020
Ba Nuclear Physics	With requirements	N/A	30.09.2020
Ma Nuclear Physics	With requirements	N/A	30.09.2020
Ba Physics and Astronomy	With requirements	N/A	30.09.2020
Ma Physics and Astronomy	With requirements	N/A	30.09.2020
Ba Technical Physics	With requirements	N/A	30.09.2020
Ma Technical Physics	With requirements	N/A	30.09.2020

A 6. The information about the gained credit points has to be consistent.

H Decision of the Accreditation Commission (26.09.2014)

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

The Accreditation Commission discussed the procedure and made minor editorial amendments to the wording of some requirements and recommendations. Concerning requirement 6, the HEI submitted documents in advance of the meeting which confirm that the official documents provide clear regulations regarding the award of credit points. Apart from that, the Accreditation Commission follows the assessment of the peers and of the Technical Committees.

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

Degree Programme	**ASIIN seal**	**Subject-specific Label**	**Maximum duration of accreditation**
Ba Material Science and New Material Technology	With requirements for one year	N/A	30.09.2020
Ma Material Science and New Material Technology	With requirements for one year	N/A	30.09.2020
Ba Nuclear Physics	With requirements for one year	N/A	30.09.2020
Ma Nuclear Physics	With requirements for one year	N/A	30.09.2020
Ba Physics and Astronomy	With requirements for one year	N/A	30.09.2020
Ma Physics and Astronomy	With requirements for one year	N/A	30.09.2020
Ba Technical Physics	With requirements for one year	N/A	30.09.2020

Degree Programme	ASIIN seal	Subject-specific Label	Maximum duration of accreditation
Ma Technical Physics	With requirements for one year	N/A	30.09.2020

Requirements

For all degree programmes

A 1. (ASIIN 2.3) The module descriptions must be updated according to the comments made in the accreditation report (factual workload, module description of the final thesis, including increased number of ECTS for the thesis for adequate weighting, module description of internships, consistent module titles, coding of modules).

A 2. (ASIIN 4) The examination modalities must be adapted to intended module objectives.

A 3. (ASIIN 2.2) The learning outcomes must be published and available to all stakeholders (especially to students and staff).

A 4. (ASIIN 7.2) A programme-specific Diploma Supplement has to be prepared and handed out to students on a regular basis providing information about the objectives, intended learning outcomes, structure and level of the degree, as well as about an individual's performance. It must also explain the educational system of Kazakhstan in order to foster comprehensibility and comparability between the educational systems.

A 5. (ASIIN 3.2) The students' workload per semester must be set at a level that avoids structural pressure on training quality. In line with the ECTS Users' Guide, the workload per semester must not exceed a maximum of 900h. The ECTS credits awarded must be adapted accordingly.

Recommendations

For Bachelor and Master degree programme Physics and Astronomy

E 1. (ASIIN 2.6) It is recommended to include recent findings in the field of Astronomy into the curriculum.

For all degree programmes

E 2. (ASIIN 5.3) It is recommended to offer more courses taught in English and to further enrich international scientific literature resources.

E 3. (ASIIN 1) It is recommended to make all formal specifications of the programmes visible on the university's website.

E 4. (ASIIN 5.1) It is strongly recommended to facilitate the options for teaching staff to get more time for research activities.

I Fulfillment of Requirements (11.12.2015)

The accreditation commission discusses the procedure. Taking the statements of the peers and technical committee into account, the accreditation commission assesses requirement 1, 4 and 5 to be not fulfilled.

Justification

- Requirement 1: As the module descriptions of the degree theses are still missing and the use of the ECTS-credits shows some serious inconsistencies the commission assesses requirement 1 to be not fulfilled
- Requirement 4: As the diploma supplements do not contain information about the overall learning objectives, the commission assesses requirement 4 to be not fulfilled. Furthermore the commission decides that the obviously incorrect usage of the relative ECTS-marks shouldn´t be considered for this requirement but mentioned in the covering letter to the HEI
- Requirement 5: While the HEI provides plausible guidelines for the use of ECTS credits, these guidelines are not put into practice consistently. Based on the module descriptions especially the calculation of the students´ workload and its transition into ECTS-credits remains still unclear. Therefore the accreditation commission to be not fulfilled.

The accreditation commission took the following decision

Degree Programme	**ASIIN seal**	**Subject specific label**	**Maximum duration of accreditation**
Ba Nuclear Physics	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ma Nuclear Physics	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ba Technical Physics	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ma Techical Physics	Requirements 1,4*,5 not fullfilled lt	n.a.	30.09.2020/6 month prolongation

Degree Programme	ASIIN seal	Subject specific label	Maximum duration of accreditation
Ba Physics and Astronomy	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ma Physics and Astronomy	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ba Material Science and Technology of New Materials	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation
Ma Material Science and Technology of New Materials	Requirements 1,4*,5 not fullfilled	n.a.	30.09.2020/6 month prolongation

* The Accreditation Commission for Degree Programmes decided to include the following indication:

"Statistical data concerning the distribution of grades should be added to the final mark in order to facilitate a reliable assessment of the grade."

J Fulfillment of Requirements (01.07.2016)

Taking the assessment of the peers and technical committees into account, the accreditation commission estimates all remaining requirements to be fulfilled. As proposed by the technical committees the inconsistencies/miscalculations in terms of the ECTS Credits should be indicated in the decision letter.

The accreditation commission decides the prolongation of the accreditation as follows:

Degree Programme	ASIIN seal	Subject specific label	Maximum duration of accreditation
Ba Nuclear Physics	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ma Nuclear Physics	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ba Technical Physics	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ma Techical Physics	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ba Physics and Astronomy	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ma Physics and Astronomy	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ba Material Science and Technology of New Materials	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation
Ma Material Science and Technology of New Materials	All requirements fullfilled*/**	n.a.	30.09.2020/6 month prolongation

* The Accreditation Commission for Degree Programmes decided to include the following indication:

“Statistical data concerning the distribution of grades should be added to the final mark in order to facilitate a reliable assessment of the grade.”

** The Accreditation Commission for Degree Programmes decided to include the following indication:

“It is pointed out, that the calculation of credit points will be reviewed in the course of the re-accreditation.”